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THE LUNAR CRATER ERATOSTHENES.

By MENTORE MAGGINI.

[TRANSLATED FROM THE FRENCH BY G. H. HAMILTON.]

During a journey that Professor W. H. Pickering made through Europe, it was my pleasure to be with him for a few days in the autumn of 1921 and to discuss with him certain Martian problems. He interested me so much in the study of the lunar crater "Eratosthenes," that I decided that I would also make a few observations, especially from the standpoint of a comparison with Mars, since I am one of the *associated observers of Mars.* It was thus that I made several drawings and measures of the main spots in the crater, first of all at Florence, where I was then living and afterwards at Catania; and I was able to identify nearly all the regions observed by Professor Pickering. Among the numerous drawings of the entire crater, made at Florence, two have already been published by Professor Pickering in his paper "Eratosthenes III"; they form part of the series taken in 1921. In 1922 I commenced observation of the crater with the 13-inch Merz-Cavignat of the Royal Astrophysical Observatory of Catania to which I had been transferred.

In his "Eratosthenes II," Professor Pickering treats of the atmospheric conditions necessary to enable the smallest detail in the crater to be seen. The definition due to the Sicilian sky is well known to all observers; it was particularly appreciated during the Martian opposition of 1922. Seeing 10 or even 11 is not of rare occurrence at Catania, especially during the midnight hours; during the hours that follow twilight in the evening or precede the dawn, the definition is not so good; perhaps in the first case, on account of the heating of the dome, and in the second, the wind that blows from off the sea. It is for this reason that, during the summer oppositions of the planet Mars, one cannot have good images of the disk a few months after opposition, when the planet passes the meridian at dusk. In the case of the moon, observations taken during the first and last quarter also have poor seeing.

"Eratosthenes IV" and "Eratosthenes V," the recent papers of the American savant, have decided me on a revision of my drawings and measures. It was possible for me to compile two maps of the southern wall (Fig. 1 and Fig. 2, Plate XXXI) where one can find nearly all the detail in the maps published by Professor Pickering in his fourth paper.

In compiling my maps I adopted the coördinates already traced by

Professor Pickering and filled in my detail. As to the form and orientation of the Figures, I tried to follow the American observer, in order that the reader may be able to judge of the identity of the regions observed. Fig. 1 corresponds to colongitude 40° — 90°; Fig. 2 to colongitude 90° — 120°. To these maps I have added two others which depict the northeast side of the crater; one has thus one-half of the circle which represents Eratosthenes. It is to be noted that these two maps (Fig. 3 and Fig. 4, Plate XXXII) are reproduced from observations made at Florence with an instrument which is smaller than the one I use at Catania.

The Southern Region.

Fig. 1 and Fig. 2 were compiled from drawings made almost entirely with the 13-inch at Catania. The construction of the maps requires much care; since, while there are spots which appear and disappear under given colongitudes, there are others which oscillate through an unknown period, in such a manner that with the same colongitude they are sometimes visible and at others not.

Here is a list of plats identified in the maps with their numbers and names as given by Professor Pickering.

No.	Name	Fig.	No.	Name	Fig.	No.	Name	Fig.
3	Aster	2	26	Geranium	1	39	Marigold	2
4	Azalea	2	27	Goldenrod	1, 2	40	Nasturtium	2
5	Bluebell	1, 2	28	Harebell	1	42	Peony	2
6	Buttercup	1	29	Iris	1, 2	43	Pansy	1, 2
7	Crocus	1	30	Jasmine	1, 2	44	Petunia	2
8	Camelia	1	31	Lotus	1, 2	49	Poppy	2
11 or 12	Calla	1, 2	32	Larkspur	1, 2	50?	Poinsettia	2
13	Columbine	1, 2	33	Lilac	1, 2	51	Rose	1, 2
14	Clover	1, 2	35	Lily	1, 2	52?	Thistle	2
15	Cowslip	1, 2	36	Laurel	2	53	Tulip	1,
17	Daisy	1	37	Magnolia	2	54	Violet	2
19	Dahlia	2	38	Mignonette	2	55	Wisteria	1, 2

In my maps there are several new plats, which will be easy for the reader to find by comparison with those of Professor Pickering. The identification of the details was made by means of positions; the difference may be caused by personal equation, or by a real displacement of the details, or again one may have to do with different details entirely.

To give a few examples, I will call to mind the plats of the southeast region, which I have identified with the Nos. 11, 14, 15, 26, 27 and 28. My figures show notable displacements which one cannot explain by the differences in reproduction in the case of two observers; quite recently on the 18th and 19th of May, though the extreme southern declination of the moon was very troublesome, I was able to take micrometric measures which confirmed the positions in Fig. 2. One plat, which was not drawn by the American savant, is visible in my maps, to the north of No. 14: it moves gradually towards the south as the colongitude increases, while No. 14 moves towards the east. At colongitude 104°, plat 13 is cut into three little round spots.

Another configuration which changes is that made up of plats Nos. 30, 31, 32 and 33 with the runs that meet them (end there); the whole moves towards the west as the colongitude increases. This displacement is shared also by plat No. 5 and the run which joins it to No. 30. In consequence, while the polygonal region composed of Nos. 7, 9, 30, 51 and 3 is crossed near the center until colongitude 70° by a dark trail, at colongitude 90° this trail approaches the western border of the region. Again, close by, plat No. 7 belongs to the kind of detail which we have said is not characterized by a fixed value of the colongitude; in drawings made in 1921 it is even visible at very high values of colongitude, while in 1923 and 1924 one cannot detect it after colongitude 80° For this—look at the two sketches in "Eratosthenes III."

The most important region is, without doubt, that of the South Eastern Field, partly spread out upon the rim of the crater, partly outside of it. The area likened to a *crab* is composed of a multitude of little dark spots and brilliant points, which appear for fractions of a second to the eye, and whose reproduction by means of the pencil is impossible. During the very transparent winter evenings this field has seemed to fade out under my eyes in the manner that the spots do upon Mars

The movement ascertained in this field, has seemed to me to be due to a formation of new details which attach themselves to the west of the field as the sun rises. The movement towards the interior of the crater of the ramifications of the southwest is perhaps due to the formation of a new plat near No. 51, that belonging to the central part has the appearance of a run and an increase in plat No. 55; this movement of the northeast ramification is as conspicuous as (the movement of ?) plat No. 43. In the same manner, the movement in the *arm* A (Eratosthenes II, p. 11) may be caused by the increase in diameter and brilliancy of a little white spot which occupies the center of curvature of the arm, to the east of the crater rim.

Changes also reveal themselves from one lunation to another in the South Eastern Field, changes which are, above all, due to variations in the visibility of the little dark or light spots which make up the region. These spots have not the same appearance under the same colongitude, thus the eye of the observer is constrained to coördinate them under different aspects. Fig. 2 shows the appearance of the field as it was in the 13-inch of Catania on March 13, 1922, colongitude 106° and May 19, 1924, colongitude 104°. The dark spots that one sees to the south of plat 49 formed, with this plat, a separate triangular region: the large nuclei more to the south formed the western border of the field. These nuclei remain visible until the field lightens up (fades out) and the sun sets on the horizon of Eratosthenes.

The Main and Cross Runs.

My attention was attracted by these trails on account of the way they act.

Under the nearly tangential rays of the sun, Main appears as one of the numerous steps which form the crater rim; a small craterlet, about two kilometers wide, half broken down on the east, occupies its southern extremity. A craterlet is near the northern extremity, upon the rim. Under these conditions of illumination one cannot see Cross, but at colongitude 40° one can see a straight line, very brilliant, which cuts Main at a right angle, as it passes over the craterlet at the southern extremity; this brilliant line corresponds to an elevation of the soil (floor) and marks the region where Cross will appear. The true Cross, a dark line, does not always appear at the same colongitude; to give an example, during the month of October, 1921, I saw it the first time at colongitude 55°, while in March, 1922, it was already quite visible at colongitude 40° and I was able to take a micrometric measure of it.

These lines, Main and Cross, have a very peculiar appearance. Cross is a trail of a grayish color whose width increases with the colongitude, and presents the same characteristics of numerous *runs* which one can see in its neighborhood; it is, one may say, a line which unrolls itself without regard to the unevenness of the soil. Main appears as a line in *relief;* the circumstance that it is visible from the first days, makes us lean towards this explanation; the changes in its width are large, for sometimes it is a gray stumped line (as in a stumped drawing), at other times a fine line, especially near the setting of the sun.

Professor Pickering in "Eratosthenes IV" reminds us that the measures taken of the displacement of Main made at Jamaica are the only published measures up to now. I commenced measures of Main with the 13-inch at Catania in March of 1922, and, from the first lunation, I was able to confirm the movement ascertained by the American savant. Since then I have taken numerous measures of Main and of Cross. The method of measuring is like that described in "Eratosthenes II" and taking as primary stations two little craters to the northwest and to the east of Eratosthenes; the azimuth of the two craters, determined by Professor Pickering, having the lunar axis in mind, is $116°.3 \pm 0°.4$. Since we were most concerned with a verification of the results, I adopted this value. The measures obtained up to May, 1924, are to be found in the following table. They are preceded by those which I was able to obtain from the drawings of the crater made in 1921 at Florence; in these drawings the two craterlets were always fundamental.

AZIMUTH OF MAIN AND CROSS RUNS.

Date	Colongitude	Main	Cross	
1921 October 10	21°3	50°5		From Drawing
11	32.8	48.8		"
12	43.9	34.3		"
13	55.0	37.2	307°3	"
14	66.1	30.2	304.3	"
15	77.7	34.2	309.3	"
17	101.4	22.3	313.8	"
18	113.8	23.2	312.3	"

Date		Colongitude	Main	Cross	
1921 October	19	126°.2	21°.2	307°.5	From Drawing
	20	138.9	22.3	313.4	"
	21	154.6	33.8	312.8	"
November	12	58.3	37.5	313.5	"
	13	69.7	36.0	311.8	"
	14	81.9	27.5	310.0	"
	16	107.0	15.5	312.5	"
	17	120.0	18.7	312.6	"
December	10	37.7	40.3	.....	"
	14	85.5	33.0	309.3	"
	15	100.2	20.8	310.4	"
	17	127.0	22.8	315.3	"
1922 March	8	28.1	50.0	.....	Micrometer
	9	40.3	45.7	312.1	"
	11	67.3	39.3	312.5	"
	13	105.8	14.9	308.0	"
April	9	74.2	35.9	313.3	"
	10	86.4	28.1	311.7	"
July	6	61.3	36.0	312.4	"
1923 April	27	51.8	35.8	307.2	"
	28	64.0	31.1	309.3	"
May	26	44.2	40.2	310.6	"
	27	57.1	36.3	313.3	"
	28	68.5	32.7	309.7	"
August	22	40.6	40.8	.....	"
	23	51.4	37.0	312.4	"
	24	63.8	30.9	308.9	"
	25	76.1	32.2	309.5	"
	26	90.4	18.6	312.2	"
	27	102.3	10.2	313.6	"
Sept.	22	59.6	31.9	315.7	"
	23	70.9	35.0	313.4	"
	24	81.7	30.2	309.8	"
	25	96.8	16.8	311.2	"
	26	109.0	15.1	312.7	"
	29	146.2	27.5	311.5	"
October	24	88.4	18.0	311.0	"
	25	100.6	13.9	314.2	"
	26	112.2	21.7	313.8	"
Nov.	22	83.0	30.6	312.7	"
	23	94.7	20.1	312.5	"
1924 Feb.	19	77.8	29.3	308.3	"
	23	133.8	25.7	312.0	"
March	18	65.9	30.5	305.5	"
	20	91.5	14.0	304.0	"
April	15	46.7	37.7	310.2	"
	16	59.9	38.0	316.4	"
	17	70.5	35.0	314.0	"
	23	144.2	28.2	313.9	"
May	18	91.4	21.3	309.8	"
	19	103.6	10.3	314.8	"

These measures have been plotted in Fig. 5, where the upper curve represents Main, the lower Cross; the measures plotted from the drawings are marked by little circles; their accord with those taken with the micrometer shows us the degree of precision obtainable in drawings.

With the aid of the data in the table one could get the mean values and trace a curve giving the average rate of movement of the phenomenon. One can see this curve which represents Main as a dotted line in the upper portion of Fig. 5: it is formed by two straight lines, from

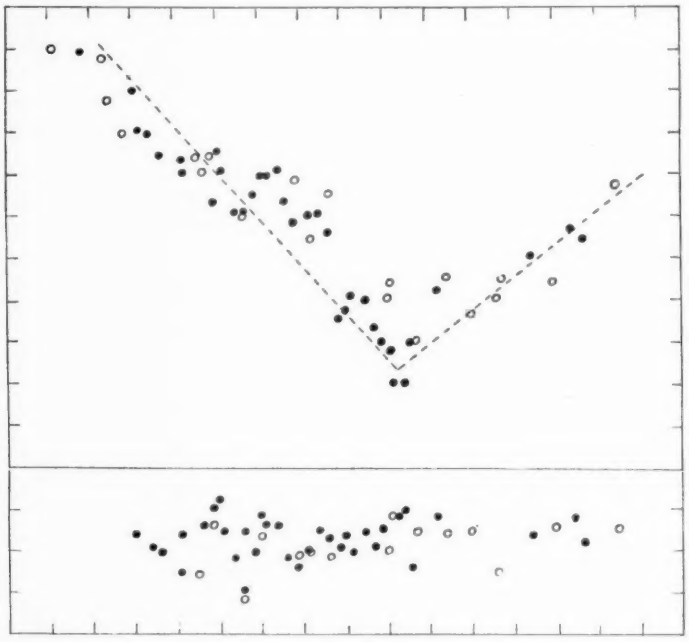


FIG. 5.

which a uniform motion of Main can be deduced. This displacement will be found to be 1° in azimuth for 2°.2 of colongitude during the first half of the (lunar) day, and 1° in azimuth for 3° of colongitude during the second half; the quick change in the azimuth of Main takes place at mid-day for the crater. One has thus reduced to its most simple geometrical expression the azimuth variation curve for Main, a variation so simple that we might think it an optical phenomenon. But, from another point of view, the differences in the measures are much greater than the errors of observation, and in such a manner that, superimposed on this regular motion, one has to recognize the existence of another one whose origin is unknown, and on account of which a certain value in azimuth does not correspond to the same value of colongitude at every lunation. Thus we can see in Professor Pickering's measures, and also in mine, a slowing up in the movement of Main between colongitudes 50° and 85° and then a more rapid movement until colongitude 104° is reached.

During 1923 I succeeded in getting many measures of the breadth of Main and Cross, by using a scale employed for the lines on Mars.

THE NORTHERN REGION.

Fig. 3 and Fig. 4 are two maps of the northern half of Eratosthenes,

showing variations in the fields and runs exactly similar to those in the southern half mentioned above. Fig. 3 corresponds to colongitude 60°, Fig. 4 to colongitude 120°. The North Eastern Field is thus in its aspects second and third.

The floor of the crater is here strewn with tumulus (mounds?), isolated or disposed in chains, which under a tangential illumination show us the outlines of the fields. One therefore sees that the N. W. and N. E. fields are formed of depressions; to speak with more exactitude, one sees that the northern half of the floor of Eratosthenes is convex, the light regions that separate the fields being the higher, while the N. E. field is spread over two circular depressions. The regions to the north of the central peaks then remain in shadow and it seems that the North West Field is joined to that of the North East. The changes in the aspect of the N. E. field occur at varying times of colongitude, but these times are between 60° and 80°. Generally one can see the point of the field turned towards the N. W. lighten up; it seems that the dark spot which forms this point is made by a depression in the floor of the crater, which is illuminated by the sun. One often sees a dark straight line, with a northward direction, cross the crater floor from the central peaks to the first ramparts of the rim; this line has all the appearances of a ridge. At colongitude 85° one begins to see the first *runs*. First there is a gray uniform veil which extends over the fields to the northeast and north, then the central portions of the veil clear up and the gray color concentrates into trails. First of all one sees the southern *runs* which extend as far as the central peaks, following them appear the western *runs*. At colongitude 107° two *plats* form in the space between the northeast field and that of the north; these *plats* are connected one with the other and to the fields by means of six *runs*.

These maps do not show the changes in the northern field; on this part of the detail they resemble each other (the above?). But between Fig. 3 and Fig. 4, that is to say colongitude 60° and 120° the part of the field on the edge of the crater has been able to develop and transform itself. At colongitude 120° there is nothing but a large *plat* remaining, it is elliptical and full of *runs*, which contribute in furthering the likeness to "canals" in this region of the moon; at this time one is able to see at least ten *runs* crossing this portion of the crater, with an area of only 25 km² between the northeastern field and the crater rim. The widths of the runs are here about one kilometer, and the plats from 1.5 to 2 kilometers.

Now one should speak of the northwestern field; its changes are no less conspicuous, and we hope to be able to give the description of this field together with numerous small details on the western side of Eratosthenes, in a future Paper.

The Lunar "Canals."

The most interesting features on the maps are certainly the dark

trails or *runs,* which resemble from certain points of view the lines of Mars. Many lunar regions studied with the same care as has been given to Eratosthenes would reveal changes of the same order and would also show us *plats* and *runs;* I hope in the near future to give a description of the region to the south of Eratosthenes near Gambart, which I have studied since 1909.

If one compares the maps of Professor Pickering with mine, we ascertain that the observers both draw and observe in the same manner, even to the lines. Now this fact is exceptionally important, for I belong to the group of observers of Mars who see the "canals" under the form of narrow lines, often double, and geometrical in their appearance, while the American savant belongs to that group who see the lines enlarged, gray and nearly always single. It is not easy to judge as to which group of observers is on the road that leads to truth, for each one of them reproduces with fidelity that which it sees; the difference may have its root in the manner of observing and not in that of drawing. It is therefore of interest to find that in the case of the lunar trails the two observers have seen in the same manner. As far as I am concerned, the lunar lines show a much greater stability than the lines of Mars; they are continuously visible, if the seeing is good, and always equal to each other. This continuity of linear sensation is the cause, I believe, of the accord between the observers; the observers of Mars who draw the lines broad (Pickering, Douglass, Phillips, etc.,) draw what they see with stability and continuity, while the observers who draw fine lines also draw those details which only show themselves during a fraction of a second. I have said elsewhere[1] that if I only put those details seen with continuity into my sketches of Mars, my drawings would look exactly like those of Professor Pickering. One might criticize me for introducing into my drawings detail which is not always visible, but in speaking of Mars one must define the words which give the duration of visibility to a certain detail. This has been done quite recently by one of the most experienced observers, Mr. E. M. Antoniadi.[2] He classes the Martian detail as: *detail glimpsed,* or detail that is seen for no longer than a fifth of a second; *detail seen occasionally,* or that which is visible from a fifth of a second to a second; *detail seen in a continuous manner,* or that which is seen for a second or longer.

It has seemed to me that the lunar trails can be classed in this third grade of visibility; it is therefore natural that the drawings of the two observers agree in this case to a much greater extent than in the case of Mars. Does this similarity of the lunar lines to those of Mars lead us to believe that we have to do with the same phenomenon? For my part I do not hesitate in finding a common origin: an optical one.

A lunar region, very rich in detail and studied with much care for many years under very exceptional conditions, has revealed to us, as

[1] M. Maggini—Sulle linee di Marte e sulle loro "geminazione"—*Memorie della Società Astronomica* Italiana (on the Press).

[2] *Ciel et Terre,* January, 1924, p. 5.

Mars did to Schiaparelli, numerous dark trails (or lines) and round spots. The gradual improvement in vision has attained its maximum in the lines. The glimpsed details, or invisible ones, are gathered together and integrated into linear sensations or into spots; these sensations are then, as on Mars, veritable *centers of gravity*. From the point of view of the optical theory[3] these lines and spots are the means by which the eye of the observer, who always wishes to see something, succeeds in representing fleeting detail.

It will not be unprofitable to recall that, before the lunar telescopic canals, optical theory had succeeded in discovering lunar canals observed with the naked eye. Some years ago Professor Cerulli called the attention of observers to the dark trails that the naked eye can find upon the moon, trails which have their origin in the blending of elementary spots which cover the surface of the moon. He again recalled that the telescopic image of the planet Mars, under the usual conditions of seeing, is very similar to that of the moon seen with the naked eye. It follows then that the lines of Mars are false lines and similar to those seen in the naked eye image of the moon.

With the discovery made by Professor Pickering we have reached, even on our satellite, that state of optical penetration which until today had only been reached upon the planet Mars; it would astonish us much if we did not find "canals." But, we believe that one must not consider these linear sensations of exceptional importance, one must not give them the importance that one has given, alas, to the lines on Mars! *A propos* of the lines which one can trace with the naked eye upon the Moon, Professor Cerulli wrote in this manner: "if our optical means were limited to the opera glass (binoculars), we would certainly attribute a very important rôle to these lines in Selenography. We would speak of *lunar canals* . . . . " We have arrived at doing so; but we must not forget that, with the most powerful telescope or with the finest climate, the most important rôle is played by our own eye.

Upon our Satellite the conditions of illumination change from one evening to the next with rapidity, in such a manner that one may follow with ease the process of formation of these lines; that which is not possible upon Mars. In the region of Eratosthenes it has seemed to me that a great number of lines have their origin in the contrast between two bright areas; when two bright regions form, one can see between them a dark line, curved if the regions are round, straight if they are elongated.

We will now consider the breadth of the lunar "canals." They are, in general, easier to see than the "canals" of Mars, but there are many fine ones there and even *doubles* exactly similar to those on Mars. The lunar *runs* are trails of 0".3, 0".5 or 0".7 in width just as the "canals" of Mars; we can therefore consider these two kinds of lines optically equal. "Lunar runs may be said to be of about one two-hundredth the

[3] *V. Cerulli Marte nel 1896-97* and also: *Nuove osservazioni* di Marte—(1898-99) Pubblicazioni dell Osservatorio privato di Collurania (Teramo) No. 1 and 3.

size of the Martian canals, but being also at one two-hundredth their distance, they can be studied equally well" (Eratosthenes IV, p. 5); now it is in just this equality of visual sensation that the optical nature of the two kinds of lines seems to be affirmed. In the same manner one could speak of the lines that one often sees on the bright equatorial belt of Jupiter or on that of Saturn. They are of the same order of breadth as the canals of Mars or the lunar runs and one could repeat the same reasoning concerning their proportions as has been done about these lines.

In speaking in this manner of the lunar *runs* we do not intend to completely deny the existence of these dark trails upon our satellite; most probably *Main* is a physical line and perhaps *Cross* and *Laurel run;* but it is not, it seems to us, the observed displacements which should make us form conclusions about their physical nature. Completely similar displacements occur in the Martian lines, displacements which optical theory explains by a change in the maximum distribution of elementary spots scattered over a region, perspective and the state of illumination playing a most important rôle.

I hope in the near future to return once more to the subject of lines, both Martian and lunar; even from an absolutely optical point of view these observations are of great importance. It is not the Selenographers alone, but the Martian observers as well, who should be grateful to Professor Pickering, for through the keenness of his eye and his application to the problem it has been possible to bring together in the same category the two heavenly bodies that are nearest to the earth.

Royal Astrophysical Observatory,
Catania, Italy, July, 1924.

NOTE ON THE SPECTRUM OF THE PERIODIC COMET TEMPLE-2 (1925d).

By N. T. BOBROVNIKOFF.

Seven pltes, exposures ranging from 30^m to $3^h\,40^m$, were obtained with the ultra-violet camera ($a = 14.5$ cm, $f = 81.4$ cm) during the period from June 18 to July 23, 1925. After this date the comet was too low in the south to be observed. During the period of observation the brightness increased from the 11th to the 9th visual magnitude.

The following radiations were measured: λ 3883-Cyanogen; $\lambda\lambda$ 4033, 4355, 4722, 4919-Carbon Monoxide and unidentified $\lambda\lambda$ 4133, 4591.

The continuous spectrum was weak, but increased slightly in brightness with the approach to perihelion, which occurred on August 6, 1925.

The three principal radiations at $\lambda\lambda$ 3883, 4033 and 4722 had about the same intensity the whole time of observation and did not change measurably.

Owing to the low dispersion (15° prism) the uncertainty of wavelengths is considerable, the probable errors being from 4 A to 36 A.

Yerkes Observatory, September, 1925.

ON THE CALCIUM CLOUDS.*

By OTTO STRUVE.

In 1904 Hartmann[1] discovered that the well known calcium lines H and K did not participate in the periodic displacements observed in the other lines of the spectroscopic binary δ Orionis. Furthermore, the Ca lines were found to be sharp and narrow while all the other lines were wide and diffuse. A few years later Professor E. B. Frost[2] announced the discovery of sharp and narrow calcium lines in 25 stars of early spectral type. Most of these stars showed wide and diffuse lines of helium and other elements, and it was the unusual sharpness of the Ca lines that led to associate them with the "stationary" type of line, as discovered by Hartmann in δ Orionis. Several of the stars discovered by E. B. Frost, were spectroscopic binaries, and more detailed investigations of some of them have been carried on at the Yerkes Observatory during the sixteen years that have intervened. The spectroscopic binary 9 Camelopardalis may deserve special mention. Sharp Ca lines were found by Frost and Adams[3] in the spectrum of this binary shortly after the appearance of Hartmann's paper on δ Orionis. Later 77 spectrograms were measured by Dr. O. J. Lee at the Yerkes Observatory and in 1913 he published a complete discussion of his observations.[4] The Ca lines of 9 Camelopardalis are especially strong and well defined. I have recently made a survey of all the brighter stars having peculiar H and K lines, from spectrograms that had been secured at the Yerkes Observatory. Out of 153 such objects there is only one star, namely, 62 χ^2 Orionis, in which H and K are stronger than in 9 Camelopardalis. χ^2 Orionis is also a spectroscopic binary, discovered to be such by P. W. Merrill at the Lick Observatory.[5] Its orbit has not yet been determined.

A summary of all that had theretofore been found concerning the peculiar character of the H and K lines was published in 1920 by R. K. Young.[6] His paper is of considerable importance even at the present time in that it assembled all notes and previous publications on that subject, enabling him to reach some interesting conclusions. He established the fact that the so-called "stationary" lines do not generally occur in stars of spectral type later than B3 and that there is known only one star of type B5 in which H and K are definitely found

*Presented at the meeting of the American Astronomical Society at Northfield, Minnesota, on Sept. 9, 1925.

not to participate in the periodic oscillations of the other lines. This star is ν Geminorum, interesting for its long period of 9.4 years.[7] A revision of all data available for spectroscopic binaries enabled Young to establish that in a considerable number of stars the Ca lines oscillated with the same period as the other lines, but with amplitudes which are usually much smaller than those derived for the star itself.

Further advances in the study of the peculiar Ca lines were made possible through the systematic observations of these lines by J. S. Plaskett at Victoria.[8] From a large number of observations clustered in certain definite regions of the sky, Plaskett was able to conclude that stationary lines of calcium and sodium appear in practically all stars of spectral type earlier than B3, irrespective of whether or not the star is a binary. The velocities derived from these lines are nearly, but not quite, identical with the reflex of the motion of the solar system in the given direction. This velocity does not, as a rule, coincide with the velocity of the star itself. In some cases the difference is very large, as for example in λ Cephei, where the star is approaching us with a velocity of 74 km/sec, while the Ca lines show an approach of only 14 km/sec. The component of the solar motion in the direction of λ Cephei is 13 km/sec. The velocity of the Ca lines is therefore nearly zero with respect to the stellar system. The sodium lines show a very similar behavior and their origin must be the same as that of the Ca lines. In view of the fact that our data are far more complete for the Ca lines, I shall limit myself to them only.

Plaskett is led to the conclusion that the sharp and narrow Ca lines in early type stars do not originate in the atmospheres of these stars, but are produced by vast clouds of calcium which surround the stars and which are excited and ionized by some sort of intensive radiation in the vicinity of the hotter stars. Apparently the matter which composes the clouds is normally in a state which prevents monochromatic absorption or radiation. This explains why the cooler stars do not show any trace of stationary lines. It is interesting to remark that similar conclusions were arrived at, independently, by H. Ludendorff[9] on the basis of the material collected by R. K. Young.

Plaskett's work aroused much interest, and several papers on the subject of stationary Ca lines have appeared during the past year. H. Kienle[10] subjected the observational data of J. S. Plaskett, as well as those collected by Young, to a close analysis. He was able to establish that no appreciable K-effect existed in the velocities of the Ca lines. Furthermore, he pointed out that the radial velocities of stars having emission lines are larger than those of the other stars, resembling in this respect the O stars, the planetary nebulae and the Me stars. Finally he found in the material investigated by him a decided tendency for the stars to show an increase of the K-effect with a change of spectral type from B3 to O5.

The theoretical side of the problem was taken up by J. Woltjer, Jr.[11] He found that the theory proposed by J. S. Plaskett "presents nothing

improbable". Assuming that the stationary H and K lines are due to an interstellar cloud which, being ionized by the presence of very hot stars, absorbs these lines vigorously, he was able to find that light pressure and gravitation will nearly balance; that the resistance to the motions of the stars is very small—in fact negligible for all purposes; and that the total mass of such a cloud would not be extravagant. Finally he showed that it is not improbable that very hot stars retain their ability to ionize clouds of Ca atoms at considerable distances from their surfaces.

A very important addition to our knowledge of the calcium masses which produce the effect of "stationary lines" is due to Strömberg, who has recently computed the motion of the solar system with respect to the calcium clouds.[12] Such a computation had previously been made by F. Henroteau,[13] but his results can be given but little weight because they are based on the radial velocities of only 6 objects. His results are, however, in striking agreement with Strömberg's values, based on the radial velocities of 64 objects. This is shown in Table I.

TABLE I.

SOLAR MOTION FROM CA VELOCITIES.

	Henroteau	Strömberg
A	271°	276°
D	+42°	+37°
$V_\odot$	29.3 km/sec	20.1 km/sec
K	+ 0.74 km/sec	0.0 (assumed)
Residual Vel.	.....	5.1 km/sec

The small value of the average residual velocity obtained by Strömberg proves definitely that the individual motions of the Ca masses are small compared with motions of the brighter B-type stars. It must be remembered in this connection that the value obtained by computation includes the unavoidable errors of measurement, which must be comparatively large considering that in most stars only the CaK line is measurable. Considering that the probable error of one velocity (obtained from the inner agreement of the separate spectrograms of the same object) rarely is smaller than 1 km/sec and averages about 2 or 3 km/sec, it seems probable that about one half of the residual velocity of 5.1 km/sec must be due to such errors of measurement.

This, then, is a very important argument in favor of the existence of vast Ca clouds, the motions of which are small as compared with those of the stars.

Yerkes Observations.

The chief defect of all investigations which have so far been made in connection with the study of the stationary Ca lines consists in the fact that the observational material was not sufficiently homogeneous. Young's work was based on scattered observations from various observatories. Although these observations cover the whole northern sky

in a sufficiently uniform manner, they were admittedly not very accurate and not sufficiently numerous for a more detailed investigation. J. S. Plaskett's work has the advantage of being exceptionally accurate, as demonstrated by the small probable errors of his velocities. However, these observations were not distributed uniformly along the Galaxy, and such a lack in uniformity can lead to erroneous conclusions.

In order to obtain a better distribution, I have utilized all the observations of B-type stars made at the Yerkes Observatory for the past 23 years. The details of these observations, embracing the radial velocities of 368 stars of types O and B, will soon appear in a joint publication by Frost, Barrett and Struve. Table II contains the radial velocities derived from the H and K lines for all stars of spectral type B3 or earlier. For the sake of completeness I have also included the values obtained by Plaskett and by Young. In some cases average values of two or three observers are given. The wave-lengths of the Ca lines were assumed to be as follows:

K.....3933.667 I. A.
H.....3968.476 I. A.

The same values were used by Plaskett. Young used for K the wave-length 3933.825 A. U. = 3933.683 I. A.[14] His velocities were reduced to the values adopted here. The last two columns will be explained later.

TABLE II.

Star	α (1900.0)	δ	Spectral Type	Residual Velocity	Intensity of CaK	Remarks
	h m	° ′				
+62°2363	0 00.8	+63 07	O6e	—11	..	
88 γ Pegasi	08.1	+14 38	B2	....	..	plates not suitable
Boss 46	12.4	+50 53	B2	—16	..	
+61°92	23.2	+61 57	B1	0	..	
15 κ Cassiop.	27.3	+62 23	B0	—13	3	
17 ζ Cassiop.	31.4	+53 21	B3	— 6	4	
29 π Andromedae	31.5	+33 10	B3	....	1	
19 ξ Cassiop.	36.5	+49 58	B3	— 4	3	
+47°181 Cassiop.	38.8	+47 19	B3	....	..	plates not suitable
22 ο Cassiop.	39.2	+47 44	B2	+17	1	
1 Persei	45.4	+54 39	B3	....	..	K probably v. faint
+55°191	47.0	+56 05	O6	—13	..	
45 ε Cassiop.	47.2	+63 11	B3	....	5	
+62°259	1 24.6	+62 51	B2	—15	..	
+40°501	2 16.7	+41 02	O9	—15	..	
+58°467	19.5	+58 25	O5e	—23	..	
82 δ Ceti	34.4	— 0 06	B2	....	1	
+56°693	35.5	+56 28	O6e	—20	..	
35 Arietis	37.6	+27 17	B3	—53	2	
1 Hev. Camelop.	3 11.2	+65 17	B3p	0	2	
29 Persei	11.5	+49 51	B3	....	2	
31 Persei	12.0	+49 43	B3	....	0	
61 τ Arietis	15.5	+20 47	B3	....	5	
+48°899	16.1	+48 51	B3	....	1	
40 ο Persei	36.0	+33 39	B2	+ 7	3	
38 ο Persei	38.0	+31 58	B1	....	..	plates not suitable
29 Tauri	40.3	+ 5 44	B3	....	2	

TABLE II—Continued.

Star	α (1900.0) h m	δ (1900.0) ° ′	Spectral Type	Residual Velocity	Intensity of CaK	Remarks
30 *c* Tauri	3 42.8	+10 50	B3	....	..	plates not suitable
44 ζ Persei	47.8	+31 35	B1	....	..	plates not suitable
+52°726	48.1	+52 21	O9	— 4	..	
+34°768	50.0	+34 47	B3	....	2	
45 ϵ Persei	51.1	+39 43	B1	....	3	
46 ξ Persei	52.5	+35 30	O7	+ 7	6	
40 Tauri	58.4	+ 5 09	B3	....	..	plates not suitable
+61°676 N.	59.1	+62 04	O9	— 5	..	
48 *c* Persei	4 01.4	+47 27	B3p	....	1	
—16°796 Erid.	04.7	—16 39	B3	—11	3	
+83°104 Ceph.	05.0	+83 34	B3	+10	1	
49 μ Tauri	10.1	+ 8 39	B3	....	1	
+50°973 Persei	12.6	+50 41	B3	....	6	
53 *d* Persei	14.3	+46 16	B3	— 1	4	
1 Camelopardalis	24.1	+53 42	B1	....	8	
48 ν Eridani	31.3	— 3 33	B2	0	3	
9 Camelopardalis	44.1	+66 10	O8	— 1	10	
3 π^4 Orionis	45.9	+ 5 26	B3	0	3	
8 π^5 Orionis	49.0	+ 2 17	B3	....	3	
11 Camelopardalis	57.4	+58 50	B3p	....	2	
10 η Aurigae	59.5	+41 06	B3	....	1	
103 Tauri	5 02.0	+24 08	B3	+16	7	
69 λ Eridani	04.4	— 8 53	B2	....	..	plates not suitable
+34°980	09.7	+34 12	O9	0	2	
+37°1146	14.0	+37 20	O6	— 3	..	
20 ρ Aurigae	14.7	+41 43	B3	+10	1	
6 λ Leporis	15.0	—13 17	B1	— 3	1	
22 *o* Orionis	16.7	— 0 29	B3	....	..	plates not suitable
23 Orionis	17.6	+ 3 27	B3	— 2	2	
8 Leporis	18.9	—14 01	B3	....	4	
28 η Orionis	19.4	— 2 29	B1	....	1	only one plate
25 Orionis	19.6	+ 1 45	B3p	....	..	K very faint
24 γ Orionis	19.8	+ 6 16	B2	....	4	
115 Tauri	21.3	+17 53	B3	....	0	perhaps 1
114 Tauri	21.6	+21 51	B3	+ 9	4	
30 ψ Orionis	21.6	+ 3 00	B2	— 3	0	perhaps 1
32 A_1 Orionis	25.4	+ 5 52	B3	....	1	
33 *n* Orionis	26.0	+ 3 13	B3	....	2	
25 χ Aurigae	26.2	+32 07	B1	— 6	3	
34 δ Orionis	26.9	— 0 22	B0	+ 3	2	
36 ν Orionis	27.1	— 7 23	B3	....	3	
120 Tauri	27.6	+18 29	B3p	....	7	
—1°935	27.7	— 1 40	B2	+ 7	6	
35 Orionis	28.2	+14 15	B3	— 2	4	sharp
VV Orionis	29.0	— 1 13	B3	— 2	..	
121 Tauri	29.3	+23 58	B3	—10	3	broad
37 ϕ^1 Orionis	29.3	+ 9 25	B0	+ 1	5	
39 λ Orionis br.	29.6	+ 9 52	O8	0	7	
39 λ Orionis ft.	29.6	+ 9 52	B1	+ 1	..	
—6°1234 N.	30.1	— 6 05	B1	— 3	4	
42 c^1 Orionis	30.4	— 4 54	B3	....	..	plates not suitable
41 θ^1 Orionis	30.4	— 5 27	O7	+ 2	2	
43 θ^2 Orionis	30.5	— 5 29	B1	— 6	3	
44 ι Orionis	30.5	— 5 59	O8	+11	2	
46 ϵ Orionis	31.1	— 1 16	B0	+ 7	4	
123 ζ Tauri	31.7	+21 05	B3p	....	..	plates not suitable
125 Tauri	33.5	+25 50	B3	....	2	
48 σ Orionis	33.7	— 2 39	B0	— 2	4	
47 ω Orionis	33.9	+ 4 04	B3p	+ 7	5	

TABLE II—Continued.

Star	α (1900.0)	δ	Spectral Type	Residual Velocity	Intensity of CaK	Remarks
	h m	° ′				
126 Tauri	5 35.5	+16 29	B3	0	3	
50 ζ Orionis br.	35.7	— 2 00	B0	— 1	2	
—1°1004	35.8	— 1 11	B3	....	1	
53 κ Orionis	43.0	— 9 42	B0	—18	2	
55 Orionis	46.5	— 7 33	B3	+13	3	
57 Orionis	49.1	+19 44	B2	+ 3	6	
139 Tauri	51.8	+25 57	B2	— 4	7	
62 χ^3 Orionis	58.0	+20 08	B2p	+ 1	13	very strong
—6°1391	59.4	— 6 42	B2p	....	..	plates not suitable
—4°1362	6 01.6	— 4 11	B3	— 1	2	
67 ν Orionis	01.9	+14 47	B2	....	4	
+20°1284	03.7	+20 31	O6	— 3	..	
69 f^1 Orinois	06.2	+16 09	B3	— 3	3	
70 ξ Orionis	06.3	+14 14	B3	....	5	
—6°1446	07.0	— 6 31	B3	....	3	
—19°1407	13.9	—19 56	B3	+ 6	3	
7 Monocerotis	14.9	— 7 47	B3	....	3	
1 ζ Can. Maj.	16.5	—30 01	B3	....	2	
—11°1460	16.8	—11 44	B2p	....	3	
2 β Can. Maj.	18.3	—17 54	B1	....	2	
+14°1296	21.6	+14 57	Be	+ 6	..	
18 ν Geminorum	23.0	+20 17	B5	+ 2	..	
10 Monocerotis	23.0	— 4 42	B3	....	0	plates poor
11 β Monocerotis A	24.0	— 6 58	B3p	....	1	
+11°1204	25.6	+11 19	B2e	+ 8	..	
+5°1282	26.6	+ 5 06	O8	+ 1	..	
+5°1283	26.6	+ 5 00	O6	+ 8	..	
+4°1302	27.0	+ 4 53	B2	0	..	
4 ξ Can. Maj.	27.6	—23 21	B1	....	..	plates not suitable
—1°1274	28.6	— 1 09	B3	....	1	
+6°1303	31.1	+ 6 10	O8	— 1	..	
+6°1309	32.0	+ 6 13	O8e	0	..	
+5°1334	32.5	+ 5 03	B1	+ 1	..	
S Monocerotis	35.5	+ 9 59	O7	+ 1	7	
+6°1351	36.6	+ 6 27	O6	0	..	
+4°1414	38.3	+ 4 02	B1	+ 4	..	
42 Camelopardalis	40.5	+67 41	B3	+14	4	
+8°1486	41.1	+ 8 42	B2	— 4	..	
15 Can. Maj.	49.2	—20 06	B1	....	1	
21 ε Can. Maj.	54.7	—28 50	B1	....	1	
19 Monocerotis	57.9	— 4 06	B3	+ 9	0-1	
—10°1892	7 04.6	—10 11	O7	+13	..	
28 ω Can. Maj.	10.7	—26 35	B3	....	..	plates not suitable
29 Can. Maj.	14.5	—24 23	Oe	....	..	plates not suitable
30 τ Can. Maj.	14.5	—24 47	Oe5	....	..	plates not suitable
+17°1623	31.4	+17 07	O8e	0	..	
ζ Puppis	8 00.1	—39 43	Od	....	..	plates not suitable
16 Argus	04.5	—18 57	B3	....	1	
7 η Hydrae	38.0	+ 3 46	B3	....	1	
α Pyxidis	39.6	—32 50	B2	....	..	plates not suitable
38 κ Hydrae	9 35.5	—13 53	B3	....	0	
47 ρ Leonis	10 27.5	+ 9 49	B0p	+ 3	3	
90 Leonis	11 29.5	+17 22	B3	....	2	
31 Corvi	55.8	—19 06	B3	....	0	
67 α Virginis	13 19.9	—10 38	B2	....	0	
85 η Ursae Maj.	43.6	+49 49	B3	....	0	
35 ζ^2 Librae	15 27.3	—16 31	B3	....	..	plates not suitable
40 τ Librae	32.6	—29 27	B3	....	0	
48 Librae	52.6	—13 59	B3p	+ 5	2	

TABLE II—Continued.

Star	α (1900.0)	δ	Spectral Type	Residual Velocity	Intensity of CaK	Remarks
	h m	° ′				
6 π Scorpii	15 52.8	−25 50	B2	....	1	
7 δ Scorpii	54.4	−22 20	B0	....	1	
8 β Scorpii br.	59.6	−13 32	B1	0	2	
9 ω^1 Scorpii	16 01.0	−20 24	B2	....	1	uncertain
14 ν Scorpii	06.2	−19 12	B3	....	..	plates not suitable
20 σ Scorpii	15.1	−25 21	B1	....	2	possibly 1
7 χ Ophiuchi	21.2	−18 14	B3p	....	2	
23 τ Scorpii	29.7	−28 01	B0	+10	2	
13 ζ Ophiuchi	31.7	−10 22	B0	+ 6	1	
68 u Herculis	17 13.6	+33 12	B3	....	1	
42 θ Ophiuchi	15.9	−24 54	B3	....	2	
85 ι Herculis	36.6	+46 04	B3	− 5	5	
66 Ophiuchi	55.3	+ 4 23	B3	....	1	
96 Herculis	58.1	+20 50	B3	+ 2	4	
102 Herculis	18 04.4	+20 48	B3	0	3	
34 σ Sagittarii	49.1	−26 25	B3	....	3	
11 δ^1 Lyrae	50.2	+36 51	B3	....	2	
−20°5344	52.3	−20 33	O8	− 2	..	
+26°3429	57.2	+26 09	B3	....	..	plates not suitable
+50°2708	57.7	+50 24	B3	....	4	
20 Aquilae	19 07.3	− 8 07	B3	....	..	probably very faint
20 η Lyrae	10.4	+38 58	B3	....	5	
2 Vulpeculae	13.5	+22 51	B0	....	1	
2 Cygni	20.2	+29 26	B3	+22	2	
8 Cygni	28.1	+34 14	B3	− 4	4	
39 κ Aquilae	31.5	− 7 15	B0	+ 6	3	
44 σ Aquilae	34.3	+ 5 10	B5	+ 5	1	Sp. type uncertain
12 Vulpeculae	46.8	+22 21	B3	....	3	
+18°4276	47.9	+18 25	O7e	+ 4	..	
22 Cygni	52.3	+38 13	B3	− 9	3	
25 Cygni	56.2	+36 46	B3	....	3	
+35°3930 N.	59.8	+35 45	O5e	+ 7	..	
+35°3930 S.	59.8	+35 45	O9	+ 4	..	
+35°3949	20 01.9	+35 19	O6	+ 4	..	
+35°3952	02.2	+35 24	B1	+ 5	..	
+35°3953	02.2	+35 31	O9e	+ 1	..	
+35°3955	02.2	+35 32	B1	+ 4	..	
17 Vulpeculae	02.5	+23 19	B3	....	1	
28 b^2 Cygni	05.7	+36 33	B2p	....	1	
+35°4001	06.5	+35 53	Ob	+ 2	..	
+35°4013	08.1	+35 54	Oa	+ 1	..	
+37°3821	08.4	+38 03	Ob	0	..	
+36°3956	10.8	+36 21	Oa	0	..	
+36°3958	10.8	+37 03	O7	+ 5	..	
+25°4165	11.0	+25 17	B3	+18	1	
+36°3987	13.3	+37 07	Oe	− 3	..	
+43°3571	17.1	+43 32	O6e	− 2	..	
45 ω^1 Cygni	27.0	+48 37	B3	....	2	
51 Cygni	39.1	+49 59	B3	− 3	2	
55 Cygni	45.5	+45 45	B2	+ 8	6	
Y Cygni	48.1	+34 17	B2	+ 6	..	
57 Cygni	49.7	+44 00	B3	....	1	
+44°3639	53.1	+44 33	O6	+ 5	..	
59 f^1 Cygni	56.4	+47 08	B0p	....	1	
60 Cygni	57.6	+45 46	B3	+31	2	
+59°2334	21 09.3	+59 35	B2	+11	5	
66 ν Cygni	13.8	+34 29	B3p	....	..	plates not suitable
68 A Cygni	14.8	+43 31	O8	0	4	
6 Cephei	17.3	+64 27	B3p	....	4	

TABLE II—Continued.

Star	α (1900.0)	δ (1900.0)	Spectral Type	Residual Velocity	Intensity of CaK	Remarks
	h m	° ′				
70 Cygni	21 23.2	+36 41	B3	....	..	plates not suitable
8 β Cephei	27.4	+70 07	B1	....	0	perhaps very faint
9 Cephei	35.2	+61 38	B2p	+19	1	
+56°2617	35.9	+57 02	O6	— 4	..	
80 π^1 Cygni	38.6	+50 44	B3	—17	4	broad
81 π^2 Cygni	43.1	+48 51	B3	—11	6	broad
16 Pegasi	48.5	+25 27	B3	+26	2	
+55°2639 Cygni br.	48.8	+55 20	B3	+18	1	
H. R. 8427	22 02.0	+47 45	B2	+16	..	
19 Cephei	02.1	+61 48	O9	0	8	
22 λ Cephei	08.1	+58 56	O6e	0	6	
31 Pegasi	16.6	+11 42	B3p	....	1	
52 π Aquarii	20.2	+ 0 52	B1b	—11	5	
6 Lacertae	26.1	+42 36	B3	+ 3	4	
10 Lacertae	34.8	+38 32	O9	— 3	5	
12 Lacertae	37.0	+39 43	B2	—14	4	
16 Lacertae	51.9	+41 04	B3	—12	4	
+47°3985	52.7	+48 09	B3	....	4	
1 Cassiopeiae	23 02.4	+58 53	B1	+ 7	5	
H. R. 8800	02.7	+45 33	B3	+ 3	..	
H. R. 8803	03.0	+59 13	B2	+ 4	..	
1 Hev. Cassiopeiae	25.4	+58 00	B3	....	1	
Boss 6142	50.5	+56 53	Bp	—14	..	
8 σ Cassiopeiae	53.9	+55 12	B2	....	3	

The radial velocities given in the table are the residual velocities which are obtained after subtracting from the observed velocities the components due to the solar motion. These components were obtained from a diagram constructed by Professor Van Biesbroeck using the following values for the solar motion: $A = 270°$; $D = +30°$; $V = 20.0$ km/sec. These values are sufficiently close to those obtained by Strömberg. In view of the fact that systematic motions seem to exist among the Ca velocities, it seemed unnecessary to make a new solution for the solar motion, or to use the exact values obtained by Strömberg.

The K-effect.

Table II contains the radial velocities of 130 objects. Of these 71 were observed at the Yerkes Observatory. Taking the mean of all residual velocities, we obtain what is called the *K*-effect, namely, the apparent predominance of positive velocities over negative ones. This value should be very accurate, in spite of the fact that the solar motion was assumed and not specially computed for the material at hand. The value thus obtained is

$$K = +0.4 \text{ km/sec},$$

which lies within the uncertainty of the adopted wave-lengths of the two Ca lines. This result confirms the previous conclusions of Henroteau, Kienle and Strömberg as to the non-existence of any appreciable *K*-effect. This fact becomes significant in view of the result obtained for the 368 B-type stars observed at the Yerkes Observatory for which

K was computed in exactly the same manner. The result for the stars is

$$K = +5.5 \text{ km/sec.}$$

This value is larger than that obtained by W. W. Campbell[15] and by Gyllenberg,[16] in spite of the fact that systematic corrections were applied to every measured line,[17] and that all velocities were reduced to the best available laboratory wave-lengths, which are identical with those used at the Dominion Astrophysical Observatory at Victoria. The difference between our value and those of Campbell and of Gyllenberg is probably due to the fact that the solar motion was not specially computed but was assumed, as mentioned before. The same thing applied, however, also to the Ca velocities. We may conclude, then, that while the stars of earliest spectral types show a large K-effect of more than 5 km/sec, the calcium clouds which surround these stars, show no such effect at all.

Average Residual Velocity.

The average residual velocity obtained from the stationary Ca lines of Table II is 6.7 km/sec, which is slightly larger than the value obtained by Strömberg (5.1 km/sec). The difference is probably again due to the fact that the solar motion was not specially computed, but assumed. The average residual velocity of all B-type stars, observed at the Yerkes Observatory, is 11.5 km/sec. This value was obtained in exactly the same manner as that of the stationary Ca lines. The solar motion was obtained from the diagram. Thus the average residual velocity of the stationary lines is about one-half of that of the B-type stars. Furthermore, there is a considerable difference in the residual velocities from the stars and from the stationary lines, in that the former show a marked relation to distance. The stars which are apparently fainter, that is farther away from us, have larger residual velocities. This was first established by Plaskett, who in a recent number of the "Observatory" states that the average residual velocity of the B stars of apparent magnitude 7.5 is about 18 km/sec. Our results seem to show a progression of the residual velocities with apparent magnitude which, if extrapolated, gives a value close to that found by Plaskett. The stationary Ca lines do not show such an effect. The average residual velocities of Ca lines in O-stars is certainly not larger than that of the other stars, although they are undoubtedly farther away than the B-stars.

Systematic Motions.

In order to investigate the residual velocities of the calcium clouds I plotted on a map the velocities given in column 5 of Table II. The numbers on the map indicate the residual velocities. They are placed in the approximate position of every given star. In order not to blur the figures, it was necessary to sacrifice some accuracy in representing the positions. But care was taken to retain the general configurations.

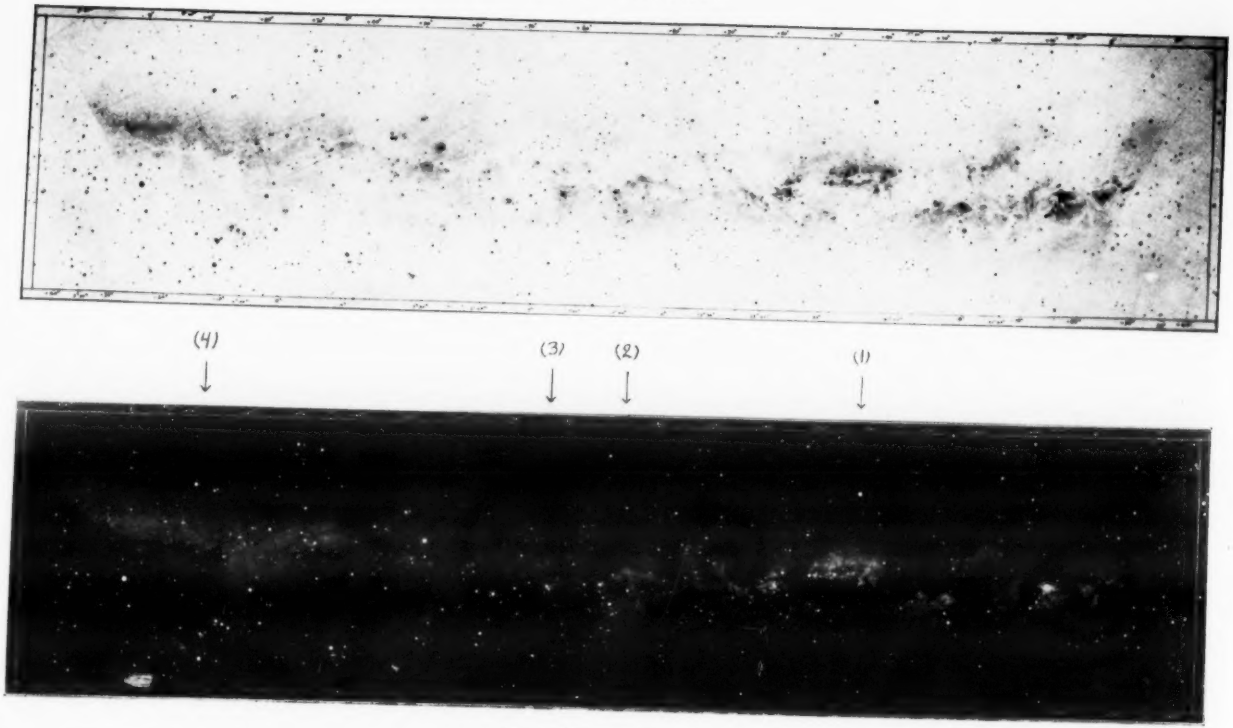
It will be seen at once that there exist a number of well defined regions which show a surprising uniformity of motion. To make this more apparent I have outlined these regions on the drawing.

We notice that there is a conspicuous clustering along the path of the Milky Way. This is to be expected, since the stars in which stationary lines occur show the same tendency. More interesting, however, are the separate regions of uniform or nearly uniform motion. This is particularly well shown in a region in Cygnus which contains only positive velocities (at about 20^h to 21^h in α and $+30°$ to $+50°$ in δ). This region had been previously noticed by J. S. Plaskett. A similar, but more extended region of large negative velocities exists in the constellations Perseus and Cassiopeia. Two small regions of uniformly negative velocity are shown near π Cygni and in Lacerta. The large region in Orion and in Monoceros is characterized by a large dispersion in the velocities. This region should perhaps be divided into two at about the border line of the constellation Orion. Very interesting is the small region in Orion containing the stars λ', λ'' and ϕ^1 Orionis.

In Orion parts of the cloud coincide in position with the great nebula. The velocity determined from the nebula is the same as that obtained from the stationary Ca lines.[18] Since the bright B and O stars are evidently situated within the nebula,[19] we are led to the conclusion that the Ca cloud and the Orion nebula are identical in position in space and in motion. However, as we shall see later, the densest portion of the Ca cloud is in the northern part of Orion and does not coincide with the densest portion of the visible nebula. It is interesting that at least one of the stars, situated in the Orion nebula and showing stationary Ca lines, has a velocity that is quite different from that of the nebula or of the Ca cloud. This star is 43 θ^2 Orionis.[18] Assuming the Orion nebula to be stationary with respect to the stellar system, which is very nearly the case, I found that this star is moving with a velocity of nearly 20 km/sec. This motion is directed away from us. As the star is apparently at the present time near that surface of the nebula which is directed toward us, we may expect that the star will continuously decrease in brightness as it is submerged into more and more dense portions of the nebula. Accurate determinations of the brightness of this star are, therefore, much needed.

Another group of mostly positive velocities is indicated in the constellation Scorpius. The existence of this region was first suspected by V. M. Slipher in 1909.[20]

The appearance of the map in Figure 1 strongly suggests the existence of separate clouds of calcium covering many square degrees, which show uniform or nearly uniform motion as a whole. Table III contains the more conspicuous clouds of this nature with their average velocities referred to the stellar system.



THE MILKY WAY

north of declination —20° for 1925.0. Drawn by Dr. Fr. Goos from photographs by Professor Max Wolf, Heidelberg. Edition Henry Grand, Hamburg, Germany, 1921. (Reproduced by permission of Dr. Goos.) The arrows on top of the drawing indicate some of the more conspicuous Milky Way clouds: (1) Cygnus cloud, between Gamma and Beta Cygni. (2) Cassiopeia cloud, extending toward Cygnus. (3) Perseus cloud. Faint portion of Milky Way. (4) Milky Way in Monoceros.

TABLE III.

Group	Residual Velocity
Orion-Monoceros	+ 1.2 km/sec
Perseus-Cassiopeia	—12.0
Lacerta	— 9.2
π Cygni	—14.0
Cygnus group	+ 4.8
Scorpius	+ 5.2

Since the distribution of these velocities cannot be due to an error in the assumed value and direction of the solar motion, it is distinctly shown that systematic motions of the calcium clouds exist.

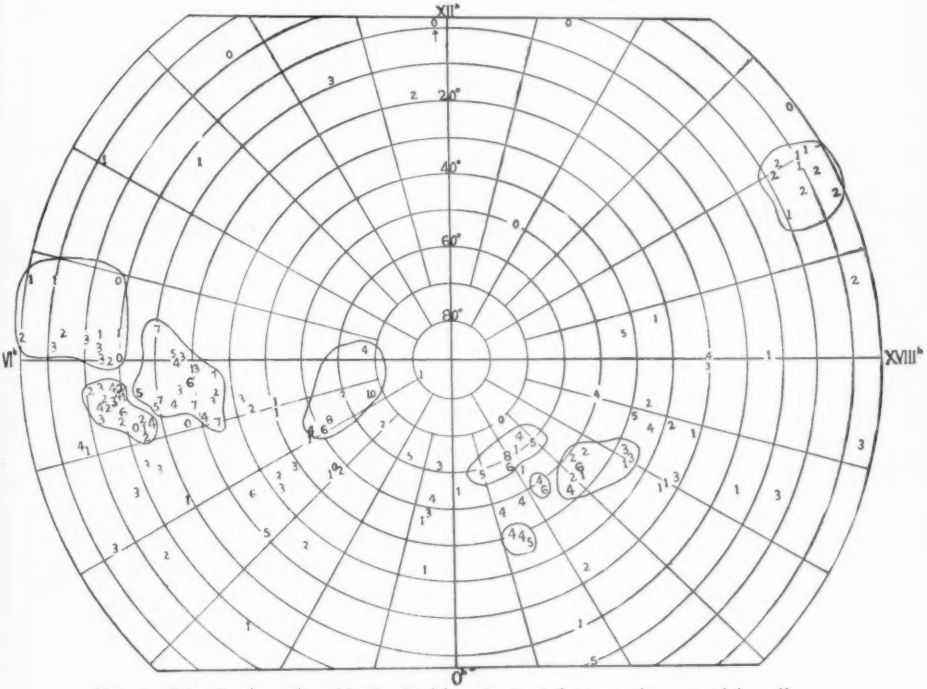


Fig. 1. Distribution of residual velocities obtained from stationary calcium lines.

If we compare our map in Figure 1 with that of the Milky Way, we find a definite relation between some of the regions enumerated in Table III a d some of the more distinct Milky Way clouds. The Milky Way drawings of Dr. F. Goos are best suited to such a comparison.[21] It is obvious that the Ca region in Cygnus is identical with the brilliant Milky Way cloud between γ and β Cygni. The region farther north, extending to nearly 0^h in α, corresponds to the Milky Way cloud extending from Cassiopeia to α Cygni. The Perseus-

Cassiopeia region may be identical with the faint portion of the Milky Way in these constellations. To be sure, there are some very distinct Ca clouds, like those of Orion, Lacerta and Scorpius, which do not coincide with any of the brilliant patches of the Milky Way. They are probably closely associated with some of the dark and the bright diffuse galactic nebulosities.

Calcium Clouds Outside the Milky Way.

If the Ca clouds are related to the Milky Way, or to some of its bright or dark nebulae, as was suggested also by H. D. Curtis,[22] we are confronted with the question whether the "stationary" or "sharp" Ca lines are purely galactic phenomena. Plaskett[23] has shown that this is not the case, since there is at least one star, namely ρ Leonis, which is situated far from the Galaxy (Galactic latitude 53°), and contains stationary Ca lines.[24]

The question of the existence and distribution of stationary Ca clouds outside the Galaxy is important; we would not necessarily expect every B star to be surrounded by a cloud of calcium, especially if such a star lies outside the Milky Way.

However, this question is greatly complicated by the possibility that in addition to the stationary lines, there are H and K lines present in the spectra of the stars, which are produced by stellar atmospheres.

The Stellar Ca Lines.

Various methods may be applied in the determination of intensity curves for spectral lines. Fowler and Milne[25] have approached the matter from a theoretical point of view. Their results show that the intensity curve of the ionized Ca lines depends greatly on the value of P_e, *i. e.*, the partial pressure of electrons from all sources. The two curves which they give for ionized calcium at $P_e = 10^{-6}$ atmospheres and at $P_e = 1.31 \times 10^{-4}$ tmospheres show very different fractional concentrations of ionized Ca atoms for stars of spectral type B0. The value of P_e cannot be ascertained with sufficient accuracy to interpolate the true curve. Furthermore, as pointed out by Fowler and Milne, the marginal appearance of a line depends upon various other factors, such as the relative abundance of a given element, the actual value of that "very small fraction of atoms" which is necessary to produce a line visible in our spectra, etc. All of these sources may produce large uncertainties in the lower branches of the theoretical intensity curves.

As an example of this uncertainty it may be mentioned that Plaskett believes that the curves of Fowler and Milne indicate that the ordinary lines H and K of stellar origin should not disappear until about type B0 or earlier.[26] At the same time Kienle,[27] also from theoretical considerations, concludes that they should not exist in any stars earlier than B3. Apparently, the theoretical method is not sufficiently accurate to solve this problem.

I have found it more satisfactory to use observational data. The

only detailed investigation, that is known to me, of the intensities of the H and K lines in various spectral types, is that of Dr. D. H. Menzel.[28] Unfortunately his data do not cover the spectral types earlier than B8. In order to supply these data, I have made out a list of stars of earlier types, from which I have estimated the intensity of the K line on an arbitrary scale. The H line is not suitable for an investigation of this kind, because it is frequently blended with the Hϵ line of the Balmer series of hydrogen. The scale of intensities was selected in such a way that the intensity of the K line in α Lyrae, which happens to be almost identical with the intensity of the stationary K line in 9 Camelopardalis, was given a value of 10. Zero denotes complete absence of the K line, or at least an intensity which is less than one twentieth of the intensity of the same line in Vega. This method of estimates seems to give fairly accurate results. Since the spectral region near λ3900 is often underexposed on our plates and is greatly affected by atmospheric conditions during the exposure, it seems very doubtful that photometric measurements would have given greater accuracy. In order to avoid as much as possible the effect of the calcium clouds and supposing that they are phenomena more frequently encountered in or near the Milky Way, I have chosen as representatives of the earliest types only stars of high galactic latitudes. Table IV contains the results of these estimates. Several stars used by Menzel were selected in order to make our scales directly comparable. The last column contains the conversion factor of the two scales.

TABLE IV.

Star	Spectrum	Estimated Intensity of K		Factor
		Struve	Menzel	
α Virginis	B2	0		
η Ursae Majoris	B3	0		
30 Sextantis	B5	1		
θ Coronae	B5	0		
α Leonis	B8	1		
β Tauri	B8	2	3	1.5
δ Sextantis	B9	2		
66 Eridani	B9	3		
α Lyrae	A0	10	12	1.2
α Cygni	A2	20		
β Leonis	A2	30	30	1.0
α Ophiuchi	A5	100	120	1.2
			Mean	1.2

Reducing my estimates to Menzel's scale, I obtain the following intensities for various spectral types:

TABLE V.

B2	B3	B5	B8	B9	A0	A2	A5
0	0	0.6	1.8	3.0	12	30	120

In order to calibrate my scale of intensities, I have determined in stellar magnitudes the difference between the light in the K line and in the adjoining portion of the continuous spectrum. The method used

is described in another paper.[29] The results for three stars are as follows:

TABLE VI.

Star	Intensity of CaK		Intensity Contin. sp.-line in stellar mgs.
	Struve	Menzel	
α Lyrae	10	12	1.8
γ Orionis	4	..	0.8
β Tauri	2	3	0.6

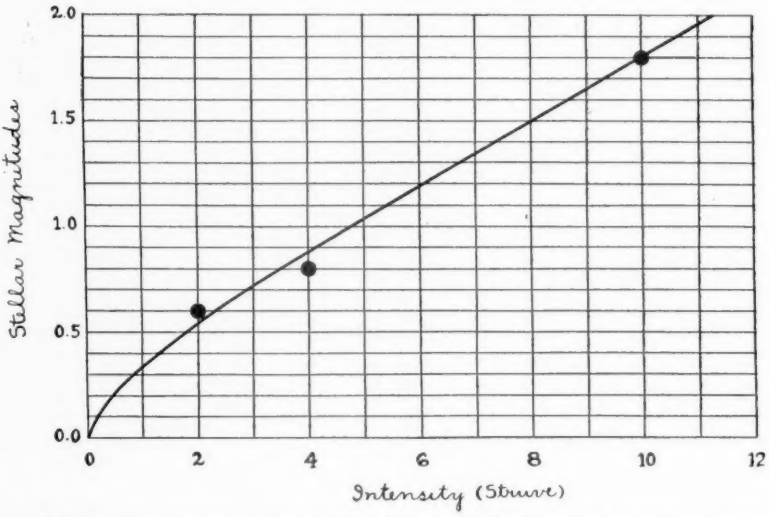


FIG. 2. The abscissae give the intensities of the K line. The ordinates contain the corresponding differences between the continuous spectrum and the K line, expressed in stellar magnitudes.

Figure 2 shows the relation between stellar magnitudes and the intensities.

Figure 3 represents the intensity curve of the stellar Ca line K. Our values fit remarkably well into this curve. At the right of the drawing I have shown the curve for the earlier types only, drawn to a larger scale. It will be seen that the intensity is zero for B3 and earlier, and that it rapidly increases for types later than B5.

Concentration of Ca Clouds Near the Plane of the Milky Way.

Table IV shows also that there exist stars of spectral types B2 and B3 which have no Ca line perceptible with the Bruce spectrograph. Not only do the stellar Ca lines vanish at such high temperatures as must exist in these stars, but furthermore, the stationary lines do not appear with the same strength as they do in similar stars in lower galactic latitudes. This seems to show that the Ca clouds, as do also the diffuse nebulae, show a strong concentration toward the plane of the Milky Way.

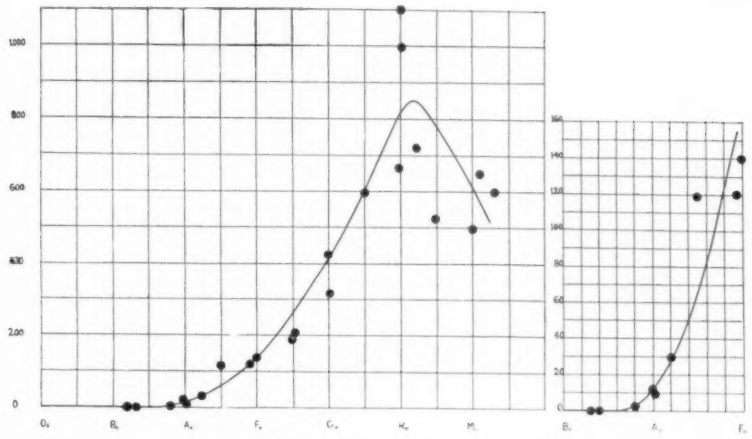


FIG. 3. Intensity curve of the stellar K line.

Here, then, we have a strong argument in favor of the hypothesis of separate Ca clouds. The existence of such a cloud in the vicinity of ρ Leonis shows simply that such clouds are not invariably connected with the Milky Way, but that they occur in small numbers also in high galactic latitudes, as is also the case with the dark obscuring nebulosities.[30]

The Ca Lines in Spectral Type B3.

The intensity curves in Figure 3 indicate that the stellar lines of calcium are practically absent in type B3. This result is supported by the value obtained for the K-effect. From the Ca lines we found $K = +0.4$ km/sec; while for the B stars, according to the Yerkes results, $K = +5.5$ km/sec. Of the 130 objects used in this investigation 34—all taken from the Yerkes observations—are of spectral type B3. If we suppose that the Ca lines of B3 stars are due to stellar atmospheres and not to the clouds, we should have for this group of 34 stars: $K = +5.5$ km/sec, since a special investigation has shown that K does not change appreciably from spectral type B0 to B9. Our 34 B3 stars constitute about one quarter of the total mass. Therefore, if their Ca lines were due to the stars and not to the clouds, we would expect to get for the whole mass of 130 objects:

$$K = +5.5/4 \text{ km/sec} = +1.4 \text{ km/sec}.$$

The value actually obtained is about one-fourth of this, proving that the Ca lines in B3 stars are of the stationary type and that the purely stellar line, if present at all, cannot be much stronger than about one quarter of the stationary line.

(To be continued.)

CAMILLE FLAMMARION.

By HECTOR MACPHERSON.

Camille Flammarion, of modern French astronomers the best known to the world at large, was born at Montigny-le-Roi, in the department of Haute Marne on February 25, 1842. His parents intended him for the priesthood, and he received his elementary education in an ecclesiastical seminary at Langres. Even as a child, however, his interests extended to the wide field of science. In his "Popular Astronomy" there is reproduced a drawing, which young Flammarion executed at the age of eleven, of the comet of 1853. Of this he wrote, "A child thinks wonderful an ordinary comet which, for the first time, gives him an idea of these celestial apparitions; this was how the comet of 1853 struck myself, if I may be permitted to recall a personal recollection, when in the month of August of that year, I viewed it from the top of the ramparts of the ancient city of Lingons, shining with its calm light in the northern sky, still illuminated with the warm brightness of the summer twilight. I even made a drawing of its appearance, without suspecting that in the future this little drawing would have the honour of publicity."

Within the next few years, Flammarion definitely abandoned the idea of an ecclesiastical career, and in 1858 he entered the Paris Observatory as junior assistant to the famous LeVerrier. The post of assistant to the co-discoverer of Neptune was, however, no bed of roses. Le Verrier's life, said Flammarion long afterwards, "would have been still more useful to science and humanity if he had possessed a more sociable character and a more disinterested love for the general progress." Many members of Le Verrier's staff could not tolerate the chief's autocratic methods and irascible temper and Flammarion was no exception. In 1862, therefore, he left the Observatory, and for the next four years, while holding a post on the Bureau des Longitudes, took a course at the Sorbonne. Meanwhile he had blossomed forth as a writer on astronomy. His first book, "The Plurality of Inhabited Worlds," was published in 1862, and in the same year the youthful author was appointed scientific editor of the *Cosmos,* and three years later of the *Siècle*. During the next decade Flammarion was much occupied with writing and lecturing, but he found time for various scientific experiments, making several balloon ascents with the object of studying atmospheric conditions at high altitudes. Flammarion's earliest research work in astronomy related to double stars, and in 1873 he made his first communication on this subject. During the next few years he computed the orbits of a large number of binary stars and in 1878 he drew up and submitted to the academy a list of optical doubles.

On more than one occasion Flammarion made preliminary investigations which foreshadowed important advances. Of some significance was his work on star-drift and star-streaming. In 1870 Proctor had made the discovery of a genuine case of star-drift,—the common proper motion of five of the seven stars of the Plough or Dipper. Flammarion commenced a series of investigations of proper motion and in 1877 he announced certain definite results. One of the most interesting cases of common proper motion was the association of the bright star Regulus with an eighth-magnitude star, Lalande 19,749. Other cases announced were Psi Aquarii and the double star Struve 2993; Theta Ursae Majoris and 1830 Groombridge; and 17 Cygni and Struve 2576. Had Flammarion pursued these researches further he might have largely forestalled the work of Boss, Eddington, Hertzsprung and others. But his versatile mind was apparently unable to concentrate for long at a time on any definite line of study.

In 1878 in a remarkable paper read before the Academy, Flammarion foreshadowed still another important discovery,—that of star-streaming. He drew attention to the existence in the southern hemisphere of a "veritable current of stars" moving from a point opposite to that of the solar motion, and a list of these was given. Here again, Flammarion did what may be called scouting work, leaving it to others to go forward along the lines which he had pointed out.

In 1883 Flammarion established his private observatory—L'Observatoire Flammarion—at Juvisy-sur-Orge in the department of Seine-et-Oise. For some years he devoted himself to work on the moon and the planets. His work on Mars and Venus was of permanent value. In 1876 he constructed a chart of the former planet based on the drawings of various observers; this Lowell considered worthy to rank among the historic maps of Mars. In 1892 Flammarion published his book "La Planete Mars," which unfortunately was not translated into English. This volume was described by an English author as "the standard work on Mars for many a year to come." It was, however, soon superseded by the works of Lowell.

On the question of the physical condition of Mars, Flammarion always held to what we may call the evidence of the senses, namely, that the temperature of the planet is much higher than those who have calculated it on purely theoretical grounds have believed it to be. He was one of the earliest observers of the Martian canals after their discovery by Schiaparelli, and while not definitely committing himself to the Lowellian interpretation of their nature, he stoutly maintained their objective reality. Messrs Evans and Maunder in 1902 made their famous experiment with the boys of Greenwich Hospital School; and the fact that the boys drew lines between numerous dots on pictures of the planet was hailed as a great triumph for the "optical illusion" theory. Flammarion, however, destroyed the evidential value of the experiment, by repeating it with French schoolboys, who drew no lines at all. Flammarion held that Mars was not only habitable but

inhabited. "As to the inhabitants of Mars," he wrote about twenty years ago, "this world is in a situation as favourable as the earth for habitation, and it would be difficult to discover any reason for perpetual sterility there. It appears to us on the contrary to be a very living world."

Flammarion's long-continued study of Venus with the Juvisy refractor did not bear out the conclusion of Schiaparelli as to the period of rotation. His own observations harmonized with a rotation period of about 24 hours and in a letter to the writer in 1921 he reiterated his belief in a short rotation period. His work on the moon convinced him long before the later work of Elgar and W. H. Pickering that the changes in tint could not be explained by varying conditions of illumination. "Geological and even meteorological changes," he wrote in 1879, "seem still to be at work on the surface of our satellite." The arena of the walled-plain Plato, he pointed out, "darkens as the sun illuminates it more, which seems opposed to all imaginable optical effects. . . . The odds are 99 to 1 that it is not the light which produces this effect, and that it is the solar heat which we do not sufficiently take into account when we are considering the modification of tints observed on the moon, although it may be quite as intimately connected as the light with the action of the sun. It is highly probable that this periodical change of tint on the circular plain of Plato, visible every month to any attentive observer, is due to a modification of a vegetable nature caused by the temperature. . . . Far, then, from having a right to assert that the lunar globe is destitute of any vegetable life, we have facts of observation which are difficult, not to say impossible, to explain if we assume a soil purely mineral and which on the contrary are easily explained by admitting a vegetable coating of whatever form it may be." This was written in 1879 and Flammarion was then a voice crying in the wilderness. Here again his work was in the nature of what may be called scout work and had he concentrated on lunar astronomy, he might have largely anticipated the work of Professor W. H. Pickering.

Flammarion's scientific reputation suffered for several reasons. The chief reason was the more or less sporadic nature of his researches and his failure to concentrate on intensive work along definite lines. Another reason was the activity which he displayed in popularising the science. His fame as a public lecturer and as the author of popular books, many of which were translated into other tongues, and his work in encouraging the cultivation of astronomy among amateurs, as evidenced in the part he played in the foundation of the Société Astronomique de France somewhat detracted from his standing as a professional astronomer. His work as a populariser flowed from his conviction that science should no longer be the domain of the cultured few, but that scientific knowledge should be widely diffused. He laid great stress on the humanizing influence of such a science as astronomy. Where, he asked, is the man of thoughtful mind who "can see without

admiration the brilliant Jupiter, accompanied by his four satellites entering the field of a telescope inundated with its light, or the splendid Saturn moving along surrounded by his mysterious ring, or a double sun, scarlet and sapphire, revealing itself in the midst of the infinite night? Ah, if men knew, from the modest cultivator of the fields, from the laborious worker in the towns, up to the professor, the man of property, the man raised to the most eminent rank of fortune or of glory, or the woman of the world apparently the most frivolous—yes, if they knew what intimate and profound pleasure awaits the contemplator of the heavens, France, the whole of Europe, instead of being covered with bayonets, would be covered with telescopes, to the great advantage of peace and universal happiness." For our humanity, he sadly declared "has not yet reached the age of reason; it has not yet issued from the environment of the brute's coarse instincts, and the most advanced nations are still essentially soldiers, that is to say, slaves."

Flammarion's literary style was picturesque and arresting and might be said to be at times flamboyant. But it was not born of mere straining after effect. He was genuinely in love with his subject and long years of astronomical research had not made the stars commonplace to him. His soul was awed by what Carlyle called the Immensities and the Eternities. Take as an example of this sense of the greatness and splendour of the Universe his reflections on stellar motions—"Like the dust of our roads the whirlwinds of stars fly on the paths of the sky. . . . Such are the stupendous motions which carry every sun, every system, every world, all life and all destiny in all directions of the infinite immensity, through the boundless, bottomless abyss; in a void forever open, ever yawning, ever black and forever unfathomable; during an eternity without days, without years, without centuries or measures. Such is the aspect, grand, splendid, and sublime of the universe which flies through space before the dazzled and stupefied gaze of the terrestrial astronomer, born today to die tomorrow on a globule lost in the infinite night."

Again of the binary stars he wrote—"Thus the double stars are so many stellar dials suspended in the heavens, marking without stop, in their majestic silence, the inexorable march of time, which glides away on high as here and showing to the earth, from the depth of their unfathomable distance, the years and centuries of other universes, the Eternity of the veritable Empyrean! Eternal clocks of space! your motion does not stop; your finger, like that of Destiny, shows to beings and things the everlasting wheel which rises to the summits of life and plunges into the abysses of death! And from our lower abode we may read in your perpetual motion the decree of our terrestrial fate, which bears along our poor history and sweeps away our generation like a whirlwind of dust flying on the roads of the sky, while you continue to revolve in silence in the mysterious depths of Infinitude."

Flammarion was thus, in a peculiar degree, the exponent of the

poetical side of astronomy; his soul was thrilled with cosmic emotion. But he was a great deal more than a rhapsodist. He was a scientific thinker; there was in his mind no division into water-tight compartments. He sought a complete world-view, and this world-view can be reconstructed by the student who peruses carefully his books and articles. The Universe, to Flammarion, is essentially the manifestation of Truth and Beauty. Theologically he would doubtless be classed as a free thinker. He had broken from the leading-strings of ecclesiastical tradition and Catholic dogma, but his writings reveal him as a Theist, who believed in Infinite Mind as the Source and Ground of the Universe. "Our science," he wrote twenty-two years ago, "is but a shadow on the face of the Reality. Infinity encompasses us on all sides, life asserts itself, universal and eternal, our existence is but a fleeting moment, the vibration of an atom in a ray of the sun and our planet is but an island floating in the celestial archipelago to which no thought will ever place any bounds. Never lose sight of the fact that there is in the void neither height nor depth nor length nor breadth, and in time neither beginning nor end. We must understand that our conceptions are relative to our imperfect and transitory impressions and that the only reality is the Absolute."

Scattered through his writings we find numerous intuitions, as it were, of the theory of relativity, and some flashes of real insight into the philosophical implicates of such a viewpoint. Dealing with the velocity of light, he wrote in 1873—"Light transports us into the infinite life; it transports us also into the eternal life." There is, he said, in the motion of light, "a surprising transformation of the past into the present. For the star observed it is the past, the vanished; for the observer, it is the present, the now. Thus the progressive motion of light carries with it through Infinitude the ancient history of all the suns and all the worlds expressed in an eternal present. The metaphysical reality of this vast problem is such that we can now conceive the omnipresence of the world in all its duration. Events vanish for the place which brings them forth, but they remain in space. This successive and endless projection of all the facts accomplished on each of the worlds is performed in the bosom of the Infinite Being whose omnipresence thus maintains everything in an external permanence."

Flammarion was a stout defender in the doctrine of the plurality of worlds and one of his first books dealt with this subject. One of his finest essays was called forth by Dr. Alfred Russel Wallace's famous article on "Man's Place in the Universe," in which the distinguished biologist maintained that life was confined to our own world. "The forces of nature," said Flammarion, "have life as their supreme end. Life is universal and eternal, for time is one of its factors. Yesterday the moon, today the earth, tomorrow Jupiter. In space there are both cradles and tombs." Equally strong was his conviction that life was co-eternal with the Universe. His belief in personal immortality was based, in the first instance, on his philosophical position and secondly

on experimental grounds. He was a keen student of psychical research and latterly his interest in this subject became deeper and deeper and his last books were devoted to the problem of immortality.

Flammarion's last piece of astronomical work was his new catalogue of Messier's clusters and nebulae. His activity was prodigious and to the very end he was in harness. He died at Juvisy-sur-Orge on the 4th of June, 1925, at the age of eighty-three, deeply mourned all over the world, and leaving behind him a name which will occupy a place all its own in the long roll of illustrious astronomers.

THE SIZE OF THE SOUTHERN SNOW CAP OF MARS IN 1924.

By E. M. ANTONIADI.

In the issue of POPULAR ASTRONOMY for November, 1924, Mr. E. C. Slipher has published an article in which he finds my estimates of the south polar cap of Mars too large during the last apparition. He further attempts to back up his contention with a series of dark photographs of the planet taken at the time.

The figures I have published of the diameter of the southern snows of Mars in 1924 are quite sound. Early in the apparition, they were a little larger than what was seen visually, as I included in my estimates the part of the cap that was immersed in the phase. By a strange coincidence, Mr. Slipher's views are controverted in the very number in which they appeared, where a drawing by Mr. Hamilton shows the size of the cap exactly as I had done! Subjoined is a comparison of my numbers with those of Mr. Hamilton and of two genuine American photographs of Mars taken at the time:

Date 1924	Observer or document	Areocentric arc subtended by the cap.
August 26	Hamilton	32°
" 27	Myself	32
" 29	Lick photograph	36
September 2	Myself	25
" 2	Mt. Wilson photograph	35
" 3	Myself	26

Hence my estimates of the diameter of the south polar snows of Mars, last year, are smaller, not larger, than the size of the snows on the subsequently received photographs taken at Mount Hamilton and Mount Wilson. The discrepancies are due to photographic irradiation and also to the difference in longitude of the various localities as compared with Paris, resulting in the study of different parts of the irregularly-shaped cap.

Such a photographic confirmation of my data is an unanswerable confutation of Mr. Slipher's position.

By printing his positives blackish, Mr. Slipher can go so far as to

extinguish the cap altogether. But what differences in his dimensions of the snows at intervals of a few minutes! The areocentric arc of the cap varies, on his prints, from 45° to 33° on 1924, July 16; from 40° to 32° on August 3; from 40° to 28° on August 16; from 30° to 24° on August 21! And while on one of his images on September 22 it measures 25° across, on the second it is entirely extinguished, and on the third it measures 10° ! Since the polar cap of Mars cannot vary in size from 30° to nothingness on the same night, it is obvious to all that Mr. Slipher's photographs are utterly untrustworthy as criteria of the dimensions of the snows of the planet.

In writing this paper, my first for an American astronomical serial, I wish to express my appreciation of the creative work done at Flagstaff by Messrs. Douglass and Lampland. I was further glad to see Mr. Van Biesbroeck's observations at Williams Bay in POPULAR ASTRONOMY for December, 1924. His results continue the fine work done on Mars in the great American observatories by the late lamented E. E. Barnard and by Professors Campbell and Hale. The unrivalled photographs of the planet taken in 1909 by Professor Hale, as well as those obtained last year by Mr. Hubble, show that the two large reflectors, due to the wonderful genius of Professor Ritchey, are the most powerful instruments ever directed on Mars.

Paris, 1925, September 4.

THE INFINITE STARS.

I stand at night and gaze up at the sky,
A huge, inverted bowl above my head;
Upon its blue-black concave surface spread,
Unnumbered twinkling lights intrigue my eye.

A bit of conscious clay upon a speck
Of age-cooled fire-mist sun-warmed into life,
With mortal eyes I glimpse a vastness rife
With stars whose years no finite mind may reck.

Across their background glows the Milky Way,
The cradle-place of new-born stars untold,
Whose light shall shine adown eternity
When those now bright have long been dark and cold.
And as I marvel at this vast array,
My spirit bows in deep humility.

—A. C. HOLM.

600 E. & C. Bldg., Denver, Colo.

AMERICAN ASTRONOMICAL SOCIETY.

REPORTS OF OBSERVATORIES
1924-1925

The reports which follow are arranged alphabetically according to the names of the observatories or of the institutions with which they are connected. Unless otherwise noted, each report covers the twelve months ending June 30, 1925.

ALLEGHENY OBSERVATORY
UNIVERSITY OF PITTSBURGH
PITTSBURGH, PENNSYLVANIA

There has been no change in the staff of the Observatory during the year. Through July and August Mr. N. W. Storer was at the Observatory as volunteer research assistant. He took charge of the photometric observing while Mr. Jordan was engaged in teaching the astronomy courses in the Columbia University summer school.

The number of plates obtained with the Thaw refractor during the year was 2,069, of which 1,789 were parallax plates, and 280 photometric. This is only a little more than half the number obtained annually several years ago, due largely to the fact that parallax exposure times have been greatly lengthened in order to use fainter comparison stars, but also because of greater restrictions on the parallax factors, and quality of the plates. No parallax plates are taken with poor seeing. With better star images and an increased number of plates as well as epochs for each star, the average probable error of a parallax determination has been brought down to practically 0″.005. During the year 800 parallax plates have been measured, giving about 35 parallaxes. Mr. Daniel remains in charge of the program, assisted by Miss Bertha Grier in measuring and computing.

A large number of light curves of variable stars both of the Cepheid and Algol types have been determined, and are awaiting sufficient funds for publication.

Mr. Burns has continued his determination of wave-lengths in the solar spectrum and the iron arc in vacuo. These spectra have been compared with the well known neon wave-lengths about fifty times each, covering the region 3800 to 7200A several times. The results for the solar spectrum in the region 4073 to 4754A measured by Burns and Meggers will soon appear as *Publications of the Allegheny Observatory*, Vol. VI, No. 7. Allowing for the small irregularities in

Rowland's Table, excellent agreement is found between the grating and interferometer measurements. The solar wave-lengths are found to be greater than those of the corresponding lines of the vacuum iron arc, the discrepancy increasing with solar intensity and with wave-length. For wave-lengths shorter than 4200A the mean value of sun minus arc is $\pm .003$ for lines of solar intensity 4 or less. These intensity classes include about 95 per cent of all solar lines. Since these lines have a red shift associated with intensity, there appears to be no need to invoke a displacement caused by gravity to explain the small discrepancy just noted. Observations on the remainder of the solar spectrum are nearing completion, and the measuring is progressing satisfactorily. The measurement of wave-lengths in the spectrum of the vacuum iron arc is about one-third completed. This program includes lines of solar intensity 3 and greater in the region 3600 to 7000A. In connection with the solar work, the relative wave-lengths of the red neon lines have been investigated, and a paper by Burns in the *Journal of the Optical Society of America* calls attention to the remarkable accuracy of former determinations of these data as shown by recurring wave number differences.

Mr. Curtis observed the total solar eclipse on Jan. 24, 1925, at New Haven as a member of the Swarthmore College expedition. Results obtained with a coronal interferometer suggested some modifications of the instrument which will be tried out in Sumatra. Four exposures on the infra-red flash and coronal spectra were quite successful. A new line at 7896A was found in the coronal spectrum. The region 6300-8806A was observed for the first time in the flash spectrum, and some 60 lines were recorded. The prominence of the calcium lines and the strength of the oxygen triplet at 7773A are the outstanding features of this region of the chromospheric spectrum. The description of the spectrograph and the results of the observations have been published by Curtis and Burns in *Publications of the Allegheny Observatory*, Vol. VI, No. 6.

The free public service has been continued as usual. The number of visitors entertained on the public nights was 5382, and the requests for tickets of admission was at least double this number.

FRANK C. JORDAN, *Assistant Director.*

STUDENTS' OBSERVATORY

UNIVERSITY OF CALIFORNIA

BERKELEY, CALIFORNIA

An exchange of members of the staffs of the Lick and Berkeley astronomical departments was inaugurated during the year. Assistant Professor Shane was engaged in experimental and observational work at the Lick Observatory during the first half-year and Astronomer J. H. Moore took charge of the course in modern astronomy and in

addition offered a graduate course in astrophysics during the second half-year.

The department, faculty and students alike, enjoyed further unusual opportunities for the study of special fields of research under two distinguished foreign masters. During the intersession and the summer session 1924, Professor C. V. L. Charlier, director of the observatory at Lund, Sweden, lectured on the distribution and the motion of the stars. These lectures, which embody the results of his more recent researches by statistical methods, have been accepted by the editorial committee for publication in the University Memoir series. During the first half-year Professor A. S. Eddington, director of the observatory at Cambridge, England, offered two courses of lectures under the auspices of the physics department, one on advanced astrophysics, which embodied the results of his latest researches on the constitution of the sun and on stellar evolution, the other on his recent work in the theory of relativity.

Messrs. Crawford and Meyer completed early in the year their extensive investigation on the identity of Comets *b* 1922 (Skjellerup) and *c* 1902 (Grigg), published in *Lick Observatory Bulletin* 354. They have also completed several orbits of the faint 17th magnitude Comet *d* 1924 (Wolf) which offered complications on account of the scarcity of observations and of serious errors in some of the photographic positions. Publication of the results has been deferred pending receipt of additional observations which have been referred to in the journals but have not been published. Mr. Meyer has also devoted considerable time to a thorough editorial revision of Professor Charlier's Memoir.

Mr. Einarsson devoted much of his time to placing his work of instruction of civil engineering students, particularly at the new summer surveying camp, on a foundation equal to that at the old camp. This work will not have to be repeated.

Students are called upon to make observations on the sun and on Polaris for azimuth and latitude. In order to save time, in some cases for the students and in other cases for the instructor, Mr. Einarsson has constructed several tables.

With the assistance of several graduate students, particularly of Mr. A. D. Maxwell, the department has been able to develop increased activity in computing preliminary elements and ephemerides of newly discovered comets and planets. For the former this work was done with such regularity that the department could provide, by means of typewritten circulars, interested American observatories regularly with the first, and as was found later by comparison with European orbits, the most accurate data for corresponding arcs and reliable observations for all new comets, except for Comet *d* 1924, for which sufficient observations were not available. For most of the comets several orbits based on arcs of increased length as observations became available, were distributed. The results, including a full account of the theoretical and practical difficulties encountered in the orbit computations and

of their solutions, have been published in various *Lick Observatory Bulletins* as follows: Comet *c* 1924 (Finsler) by A. D. Maxwell and H. Thiele; Object Baade, which turned out to be a minor planet, by A. O. Leuschner, H. Thiele and several graduate students; Object Baade, corrected elements by H. Thiele; Comet *d* 1924 (Wolf) by R. T. Crawford and W. F. Meyer (publication deferred); Comet *a* 1925 (Shajn) by Howard B. Kaster and Katherine Prescott; Comet *b* 1925 (Reid) by A. D. Maxwell; Comet *c* 1925 (Orkisz) by J. D. Shea and A. P. Alexeievsky.

Considerable progress has been made during the year in the study of the perturbations of certain minor planets with motion nearly commensurable with that of Jupiter. The details of the theoretical work and the computations were carried out by Mr. Thiele on the basis of conferences with Mr. Leuschner and in accordance with his plans. The general results were reported at various times to the National Academy of Sciences and are printed in its *Proceedings*.

By formal vote the Committee on Comets and Minor Planets of the International Astronomical Union has requested Mr. Leuschner to take the necessary steps for securing international coöperation in carrying forward the work on minor planets along the lines initiated at Berkeley.

In addition to his regular work on minor planets Mr. Thiele has rendered valuable service in connection with investigations in progress or contemplated by members of the department, and in the preparation of reports on investigations and proposals submitted by other astronomers for opinion and criticism before publication. These include research surveys on (24) Themis on account of its proximity to Y. O. 11; on Comet d'Arrest for its recent apparition; on Comet 1889 V, Brooks, describing the attempts to determine its orbit before its close approach to Jupiter; on (132) Aethra, recently rediscovered, especially with reference to its approaches to the earth; on Comet Finlay reviewing the apparitions of 1886, 1893, 1906, 1919 and the close approach to Jupiter in 1921; on the fifth satellite of Jupiter for an appraisal of the merits of the recently published orbit investigation by Robertson of the U. S. Naval Observatory; on favorable oppositions of eccentric planets; and on the physical appearance of short period comets to furnish data in connection with Mr. Leuschner's investigation of the evolution of certain planets from comets; also reports on a proposal of Mr. Davis of Yale University, to compute operators for the development of the perturbative functions (for Prof. Schlesinger); on tables proposed by Mr. Bower of the U. S. Naval Observatory for the reduction of rectangular coördinates to the equinox 1900 (for the editors of the *Astronomical Journal*). Mr. Thiele has also assisted in the computation of orbits and ephemerides.

A. O. Leuschner, *Director.*

DEARBORN OBSERVATORY

NORTHWESTERN UNIVERSITY

EVANSTON, ILLINOIS

The following changes in the staff have taken place: Dr. L. J. Comrie returned to England in August, 1925, and is now connected with the British Nautical Almanac Office. Mr. George F. Paddock has been appointed instructor in his stead. Miss Vera M. Gushee, instructor, left in February to accept an appointment at the University of Ohio and has later returned to Smith College. Miss Maude Bennot replaces her.

The work of the Dearborn Observatory continues to be devoted mainly to photographic observations for stellar parallax and to micrometric observations of double stars; though a single-prism stellar spectrograph is now being put into operation. During the year a considerable part of the effort has been directed toward the preparation of manuscript of results of observations for publication. Volume II of the *Annals of the Dearborn Observatory* is on the press and will appear before this report.

On the parallax program only 205 photographs were obtained during the year June 30, 1924, to June 30, 1925. The weather was unusually unpropitious. Also little progress was made in the measurement of plates.

On the micrometric program, 804 observations were made by Fox. Comrie observed upwards of a hundred stars on three or more nights each. Miss Gushee and Miss Bennot also observed a few pairs.

During the opposition of Mars numerous drawings of surface features were made by Fox. Miss Gushee and Fox also made numerous observations of the positions of Deimos and Phobos.

A few observations of comets Schain and Finsler were made by Comrie and Fox.

Miss Bennot has devoted considerable time to the determination of proper motions from micrometric observations.

Mr. Comrie got out his usual predictions of occultations.

Members of the staff give instruction in astronomy to students of the college and graduate school.

PHILIP FOX, *Director.*

DOMINION ASTROPHYSICAL OBSERVATORY

VICTORIA, BRITISH COLUMBIA

Staff. In July, 1924, Dr. R. K. Young resigned from the staff to accept an associate professorship in the University of Toronto. In October of the same year, Mr. J. A. Pearce joined the staff as assistant astronomer. Mr. W. H. Christie again assisted in the observing and

measuring during the college vacation term. The director attended the Cambridge meeting of the International Astronomical Union.

Observing. The observing weather for the twelve months under consideration was fair, the dome being opened and a total of 1,599 spectra secured on 211 nights. A few of these, as in previous years, were long exposure spectra of nebulae or faint stars, but apart from such the spectra secured were of stars on the regular programs using the single-prism instrument with both a medium and short focus camera. For two hours each Saturday night the telescope is placed at the disposal of the general public for observations of celestial objects of popular interest, and, as is usually the case at other observatories, this feature proves to be quite popular. Especially is this true in the tourist season from May to September when 300 or upwards are always present on each Saturday evening.

Programs and Results. The B-type program consists of all B0-B8 stars in the *Henry Draper Catalogue* brighter than 7.5 magnitude and whose polar distances are less than 101°. There are 1,056 stars in all, of which some 270 have published velocities, leaving 785 stars to be observed. Satisfactory progress is being made on this program, about half of the plates being secured and measured. A preliminary value of the velocity of B0-B5 stars between magnitudes 5.5 and 7.5 averages nearly 20 km as compared with Campbell's value for the brighter M's of 6.5 km per sec. Further measures may reduce this value but it will undoubtedly be 15 km or greater.

Three double-lined B-type orbits have been investigated in the course of the work, namely ζ_2 Coronae Borealis, H. D. 25833 and H. D. 216014, with respective periods of 12.58, 2.03 and 2.29 days. The values of $(m_1 + m_2) \sin^3 i$ for these three systems are 26.4, 9.1 and 26.6 times the mass of the sun. A few more observations are required to complete the orbit of a double-lined O8 star, H. D. 1337, the minimum mass of which is 35.7 times that of the sun.

Progress has been made in securing the spectra of stars of A-type with known parallaxes and some work has been done in seeking lines that are suitable for use in the spectroscopic determination of their parallaxes. An additional list of A-type stars from a general program is being observed as opportunity offers.

Seven binary orbits have been completed during the year of F, G, and K-type stars. The stars are Boss 1452, π Cephei, 45 Aurigae, 19 Leonis Minoris, 105 Herculis, 63 Geminorum and H. R. 8257, the last two showing both component spectra.

The study of the galactic nebulae has been continued. Wedge spectra have been secured of N. G. C. 7027 and these and the earlier spectra of the Orion Nebula have been measured and the absolute intensities of the nebular lines obtained. Considerable work has been spent with the interferometer on the Orion Nebula. The suspected fringes obtained in March, 1924, are due to a discontinuity in the light of the nebula modified in a curious manner by the instrumental equipment.

Publications. There have appeared during the year as *Publications of the Dominion Astrophysical Observatory*, Volume III, numbers 1 to 8, whilst another number is in press.

J. S. PLASKETT, *Director.*

DUDLEY OBSERVATORY

ALBANY, NEW YORK

Reductions of Observations. The efforts of the major part of the staff during the year have been devoted to the reductions of the more than 100,000 observations taken at Albany in the years 1907-08 and 1911-18. The first reductions of the declinations have been completed and the positions entered in duplicate in a card catalogue preparatory to deriving the corrections for the formation of a homogeneous catalogue of positions. The definitive clock-corrections and azimuths for all the series of right ascensions have been derived and are being applied. Investigation of the clamp differences (E-W) for 1907-08 and 1911-18 gives values in agreement not only with each other but with San Luis 1908-11, giving evidence that no changes were introduced through the double dismantling, transportation and reassembling of the Olcott meridian circle. Much of the work preliminary to the routine reduction of the observations taken by the late Professor Flint at Madison to supplement the Albany observations of the stars of magnitudes 6.0 to 7.0 between $-20°$ and $+30°$ declination has been done by Mr. Roy.

Stellar Parallax. From a treatment of the available trigonometric parallaxes Boss has derived a formula involving second and third order terms of the proper motions which represents well the median parallaxes of the stars under consideration. This should be representative of the median parallaxes of the stars in general providing the data used covers a normal condition. Comparison of the various series of trigonometric parallaxes with this formula indicates that the more extensive modern series are essentially free from systematic error. Comparisons with the Mount Wilson spectroscopic parallaxes indicate that the system for the A-type stars and that of the 1646 stars of small proper motions require considerable corrections.

Diurnal Variations. From a treatment of the material in Courvoisier's investigation of the annual refraction term in certain meridian observations Mr. Boss has shown that this variation may be interpreted as a diurnal term of the same order as that found in the San Luis and Albany observations. He also finds evidence that the annual term in the variation of latitude is due, in part at least, to a diurnal variation of considerable amplitude.

Proper Motions. Mr. Raymond has completed a study of the systematic corrections depending upon declination to the declinations and proper motions in declination of the Boss system. The corrections

derived by a general solution based on all the available material and by special solutions based on the Pulkova, Greenwich, and Cape series of positions agree in form and amount. They indicate that Kapteyn's assumption that the systematic errors of the Boss proper motions in declination vary with cos δ is erroneous, the correction curve having maxima at about $+30°$ and $-35°$ and a pronounced secondary minimum at the equator.

Mr. Wilson has shown that these corrections, though smaller than those derived elsewhere, are sufficient to explain two astronomical anomalies. Solutions for the coördinates of the solar motion based upon 2,748 stars having proper motions and radial velocities in common give the following results:

A	D	V_0	Data
270°.9	$+27°.2$	-19.0 km	Radial velocities
270.8	27.0		Proper motions, corrected

The uncorrected proper motions gave $D = +30°.5$.

The observed progressive changes in mean latitude at the international latitude stations are shown to be due to systematic errors in the proper motions used and to a slow motion of the pole. When these are removed, the residuals in the observed rates are negligible.

Stellar Luminosities. Mr. Wilson has shown that improved values of the luminosities and, consequently, parallaxes of the early-type stars may be obtained if, in place of the assumption of uniform luminosity within a spectral sub-class, one uses the relation:

$$M = M_0 + m \tan \psi + 1.65 \log (\mu + 0''.4),$$

where M_0 is the mean luminosity of the spectral sub-class reduced to apparent magnitude $0^m.0$, $m \tan \psi$ the dependence upon apparent magnitude, constant for each sub-class, and the third term represents a dependence upon centennial proper motion. This formula holds for types O to A9 and is sensitive to differences in spectrum.

Total Eclipse of the Sun. At the time of the total solar eclipse, January 24, 1925, a popular excursion to a point within the path of totality was organized and some two thousand people were thereby enabled to see the eclipse under favorable conditions.

BENJAMIN BOSS, *Director.*

GOODSELL OBSERVATORY

CARLETON COLLEGE

NORTHFIELD, MINNESOTA

There have been no changes in the staff and, as usual, the observers have had nearly full time in teaching mathematics and astronomy, together with editorial work on the magazine POPULAR ASTRONOMY.

Messrs. Wilson and Gingrich have continued the series of photographs of asteroids brighter than magnitude 12, giving preference to

the asteroids discovered by Watson. During the year 94 photographs were obtained, most of them measurable, of the asteroids.

Four photographs were obtained of Finsler's comet *c* 1924, and four were taken of the regions around Shajn's comet *a* 1925, but these failed to show the comet.

The measurement and reduction of the photographs have been completed up to the beginning of the year covered by this report, and twenty-two plates of the current year have been measured and the reductions mostly completed.

In the work of the reductions we have been assisted by student computers, paid from an annual grant of $300.00 made by the trustees of the Watson Fund of the National Academy of Sciences.

Miss Anne S. Young, director of the Mt. Holyoke Observatory, has continued her coöperation with us in connection with the asteroid work during this year.

Mr. Fath temporarily deferred his experimental work with the photo-electric photometer, in order to hasten the completion of the manuscript of a new text-book which he is preparing for freshman classes in astronomy. Parts of the manuscript have been tried out with the freshman class in astronomy at Carleton College during the past two years and Mr. Fath hopes to complete the manuscript while spending his summer vacation at the Yerkes Observatory.

Messrs. Wilson and Fath, with five students in astronomy, went to Bayfield, Wisconsin, to observe the total eclipse of the sun on January 24, 1925. Cloudy weather prevented any observations of the eclipse in that locality.

The time-service to the Great Northern, Northern Pacific and the Minneapolis, St. Paul and Sault Ste. Marie railroads has been continued regularly. During part of the college year wireless signals of wave-length 337 meters have been sent out from the college broadcasting station KFMX, at the same time (10:30 A. M.) with the signals by wire, the operator of the wireless signals being a second relay in series with the one operating the wire signals.

The Observatory has been open to visitors from two to three hours on each Saturday evening when the weather permitted.

HERBERT C. WILSON, *Director.*

(To be continued.)

CREATION.

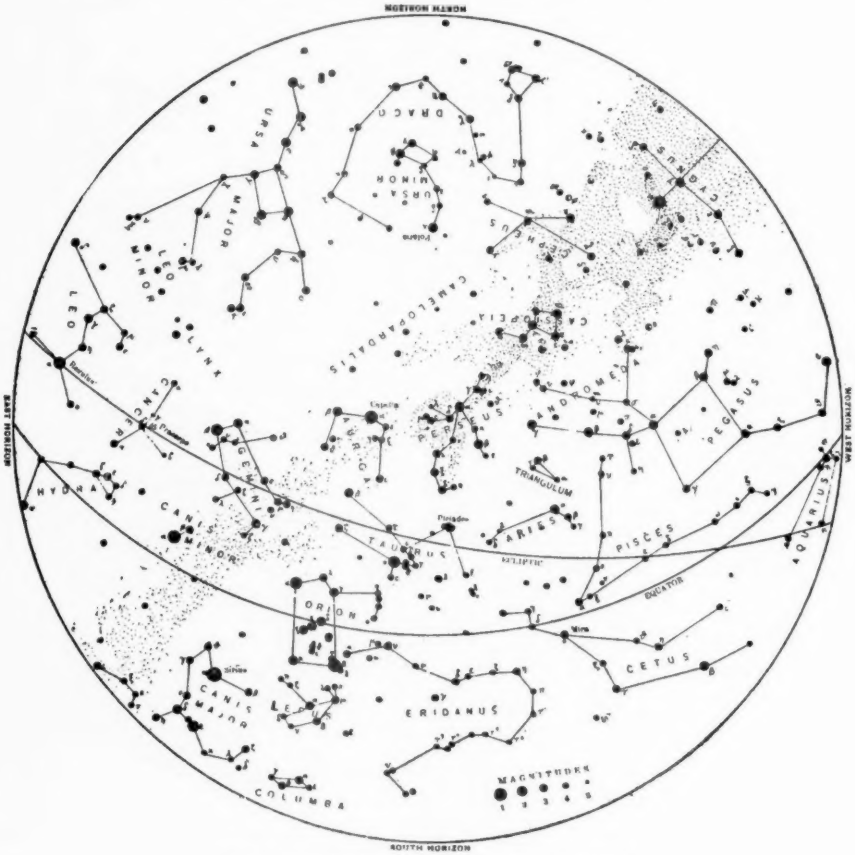
Into the boundless infinite space
My mind is laboring to rest its gait.
Creation forever and everywhere;
Inexhaustible treasure in store and reserve;
All forces obey the law of creation;
Life's shadows rest on eternity's shore.

PAUL A. BERG.

Burlington, Iowa, November 1, 1925.

PLANET NOTES FOR JANUARY.

The *Sun* will move eastward from Sagittarius into Capricornus during January. At the beginning of the month it will be moving northward at the rate of five minutes of arc a day, and at the end at the rate of sixteen minutes of arc a day. At the end of the month it will be about eighteen degrees south of the equator. On January 2 the sun will be nearest the earth for the year.



THE CONSTELLATIONS AT 9:00 P. M. JANUARY 1.

The phases of the *Moon* will occur as follows:

Last Quarter	January	7 at	1 A.M.	C.S.T.
New Moon		14 "	1 A.M.	"
First Quarter		20 "	5 P.M.	"
Full Moon		28 "	4 P.M.	"

The moon will be in apogee, farthest from the earth, on January 2 and again on January 29. It will be nearest the earth on January 14.

Mercury will have passed a point of greatest elongation west on December 31. It will remain west of the sun throughout January, but will gradually be drawing nearer the sun, and hence will be invisible most of the time.

Venus will be at a period of greatest brilliancy on January 2. It will be nearer the sun from day to day and will scarcely be visible at all at the end of the month.

Mars will be higher in the morning sky from day to day. It will be in the constellation Ophiuchus, and will be approaching the earth. At the end of the month it will be about two astronomical units distant.

Jupiter will be in conjunction with the sun on January 25. It will therefore be invisible during this month.

Saturn will be visible in the morning sky during January. It will be on the meridian about sunrise.

Uranus will cross the meridian at three o'clock in the afternoon. It will be visible in the western sky just after sunset. It will be a few degrees south of the equator.

Neptune will be visible in the early morning, and will be found in the constellation Leo, a short distance west of Regulus.

Occultations Visible at Washington.

[From the *American Ephemeris.*]

Date 1926	Star's Name	Magnitude	IMMERSION. Washington C.T.	IMMERSION. Angle from N	EMERSION. Washington C.T.	EMERSION. Angle from N	Duration
			h m	°	h m	°	h m
Jan. 2	12 B. Leonis	6.3	4 58	143	6 6	263	1 8
9	13 Librae	5.7	3 9	131	4 13	282	1 4
10	θ Librae	4.4	7 10	198	7 19	212	0 9
31	*l* Leonis	5.3	6 35	136	7 35	273	1 0

VARIABLE STARS.

The Color Index of Nova Pictoris. —A comparison between the photographic and visual magnitudes of Nova Pictoris, estimated at the Boyden Station, leads to the determination of the color index. The star α Pictoris appears on all the plates taken for the nova and has been used for the comparison. It is a typical A5 star having photographic magnitude 3.44, photometric magnitude 3.30, and color index +0.14 (King's scale). The magnitude of the nova, estimated visually on plates taken with the Bruce 24-inch refractor on two dates was as follows:

	Photographic	Visual	Color Index
1925, September 7	3.20	3.50	—0.30
September 15	3.30	3.75	—0.45

This value of the color index makes the nova, according to the accepted stellar classification, of an earlier type at present than the B0 stars, whose color index, according to King's scale, is —0.24. (J. S. P.)

Harvard College Observatory Bulletin 826.
Cambridge, Massachusetts, November 9, 1925.

Minima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract 5^h; Central Standard time 6^h, etc.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of minima in 1926 January					
	h m	° ′		d h	d h	d h	d h	d h	d h	d h
SY Androm.	0 08.0	+43 09	9.5—13.0	34 21.8				18 7		
RT Sculptor.	31.5	—26 13	9.6—10.5	0 12.3	*2 7*	9 *23*	17 15	*25 7*		
U Cephei	0 53.4	+81 20	7.0— 9.0	1 11.8	4 *21*	12 9	19 *20*	*27 8*		
Z Persei	2 33.7	+41 46	9.4—12	3 01.4	*3 7*	9 10	*21* 15	*27* 18		
TW Cassiop.	37.6	+65 19	8.2— 9.0	1 10.3	8 19	17 8	*25 22*			
RY Persei	39.0	+47 43	8.0—10.3	6 20.7	6 18	13 15	*20* 11	*27 8*		
RZ Cassiop.	39.9	+69 13	6.9— 8.1	1 04.7	7 *20*	15 0	*22 5*	*29 9*		
TX Cassiop.	44.4	+62 *22*	9.4—10.1	2 22.2	1 19	10 14	19 9	*28 3*		
ST Persei	53.7	+38 47	8.5—10.5	*2* 15.6	*2* 11	10 10	18 8	*26 7*		
RX Cassiop.	2 58.8	+67 11	8.6— 9.1	32 07.6	8 1					
Algol	3 01.7	+40 34	2.3— 3.5	2 20.8	*2* 11	11 1	19 16	*28 6*		
RT Persei	16.7	+46 12	9.5—11.5	0 20.4	5 14	12 9	19 4	*25 23*		
λ Tauri	55.1	+12 12	3.3— 4.2	3 22.9	3 12	11 10	19 7	*27 5*		
RW Tauri	3 57.8	+27 51	7.1— [11	2 18.5	*3 22*	12 5	*20* 12	*28* 19		
RV Persei	4 04.2	+33 59	9.5—11.0	1 23.4	*2 23*	10 *20*	18 17	*26* 15		
RW Persei	13.3	+42 04	8.8—11.0	13 04.8	*3* 10	16 15		*29 20*		
SZ Tauri	31.4	+18 20	7.2— 7.7	3 03.6	11 *3*	17 10	*23* 17	30 0		
RS Cephei	4 48.6	+80 06	9.5—12.0	12 10.1	*2* 17	15 *3*		*27* 13		
TT Aurigae	5 02.8	+39 *27*	7.8— 8.7	0 16.0	10 13	17 5	*23 21*	30 13		
RY Aurigae	11.5	+38 13	10.7—11.7	2 17.5	*2* 17	10 *21*	19 1	*27 5*		
RZ Aurigae	42.9	+31 40	10.6—13.3	3 00.3	*12* 17	18 18	*24* 18	30 18		
SV Tauri	45.8	+28 05	9.4—11.0	2 04.0	1 *3*	9 19	18 11	*27 3*		
Z Orionis	50.2	+13 40	9.7—10.7	5 04.9	9 0	19 11	*29 20*			
SV Gemin.	54.6	+24 28	9.8— [11	4 00.2	*3* 19	11 19	19 19	*27 20*		
RW Gemin.	5 55.4	+23 08	9.5—11.0	2 20.8	5 8	11 1	*22* 12	*28 6*		
U Columbæ	6 11.2	—33 03	9.2—10.0	2 19.2	5 *22*	11 12	*21* 17	*28 7*		
SX Gemin.	22.0	+20 37	10.8—11.5	1 08.8	8 1	16 6	*24* 11			
RW Monoc.	29.3	+ 8 54	9.0—10.8	1 21.7	4 6	11 *21*	19 12	*27 3*		
RX Gemin.	43.6	+33 21	8.8— 9.6	12 05.0		10 13	*22* 18			
RU Monoc.	6 49.4	— 7 28	9.8—10.5	0 21.5	*3* 21	11 *2*	18 6	*25* 10		
R Can. Maj.	7 14.9	—16 12	5.8— 6.4	1 03.3	7 10	14 6	*21* 1	*27 2*		
RY Gemin.	21.7	+15 52	8.9— [10	9 07.2	10 4	19 12	28 19			
Y Camelop.	27.6	+76 17	9.5—12	3 07.3	1 *23*	8 14	*21* 20	*27* 10		
TX Gemin.	30.3	+17 08	10.0—11.9	2 19.2	*3* 11	11 *20*	20 6	*28* 15		
RR Puppis	43.5	—41 08	9.4—10.7	6 10.3	*3* 6	9 16	*22* 13	*28 23*		
V Puppis	7 55.4	—48 58	4.1— 4.8	1 10.9	*3* 11	10 17	17 *23*	*25* 6		
X Carinae	8 29.1	—58 53	7.9— 8.7	0 13.0	5 18	13 *21*	*22* 0	*30 2*		
S Cancri	8 38.2	+19 24	8.2—10	9 11.6	6 *21*	16 9	*25 20*			
RX Hydrae	9 00.8	— 7 52	9.1—10.5	2 06.8	6 14	13 10	20 6	*27 3*		
S Velorum	29.4	—44 46	7.8— 9.3	5 22.4	5 8	11 6	*23* 3	*28* 1		
Y Leonis	9 31.1	+26 41	9.3—11.2	1 16.5	6 19	13 13	*20* 6	*27* 1		
RR Velorum	10 17.8	—41 36	10.0—10.9	1 20.5	*3* 8	10 18	18 4	*25* 14		
SS Carinæ	10 54.2	—61 23	12.2—12.8	3 07.2	*2* 19	9 10	*22* 15	*29 5*		
ST Urs. Maj.	11 22.4	+45 44	6.7— 7.2	8 19.2	5 12	14 7	*23* 3	*31* 23		
RW Urs. Maj.	35.4	+52 34	10.3—11.4	7 07.9	4 *20*	12 4	19 12	*26* 20		
Z Draconis	11 39.8	+72 49	9.9—13.6	1 08.6	8 16	15 11	*22* 6	*29* 1		
RZ Centauri	12 55.6	—64 05	8.5— 8.9	1 21.0	8 1	15 13	*23* 1	30 13		
RS Can. Ven.	13 06.3	+36 28	7.5—12.5	4 19.1	4 7	13 *21*	*23* 11			
SS Centauri	07.2	—63 37	8.8—10.4	2 11.5	5 *3*	12 14	*20* 0	*27* 11		
SX Hydræ	13 39.0	—26 23	8.6—12.7	2 21.5	4 18	10 13	*22* 3	*27 22*		

Minima of Variable Stars of Short Period—Continued.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of minima in 1926 January							
	h m	° ′		d h	d h	d h	d h	d h	d h	d h	d h	d h
δ Libræ	14 55.6	— 8 07	4.8— 6.2	2 07.9	5 13	12 12	19 12	26 12				
U Coronæ	15 14.1	+32 01	7.6— 8.7	3 10.9	6 21	13 19	20 16	27 14				
TW Draconis	15 32.4	+64 14	7.3— 8.9	2 19.4	1 4	9 14	18 0	26 10				
SS Libræ	15 43.4	—15 14	9.3—11.5	0 18.4	6 14	13 18	20 23	28 3				
SW Ophiuchi	16 11.1	— 6 44	9.2—10.0	2 10.7	2 12	9 20	24 12	31 20				
SX Ophiuchi	12.6	— 6 25	10.5—11.2	2 01.5	3 14	11 20	20 2	28 8				
R Aræ	31.1	—56 48	6.8— 7.9	4 10.2	6 2	14 22	23 18					
TT Herculis	16 49.9	+17 00	8.9— 9.3	20 18.1	9 11		30 4					
TU Herculis	17 09.8	+30 50	9.5—12	2 06.4	6 10	13 6	20 1	26 20				
U Ophiuchi	11.5	+ 1 19	6.0— 6.7	0 20.1	4 5	12 14	20 23	29 9				
u Herculis	13.6	+33 12	4.6— 5.4	2 01.2	7 13	13 17	19 21	26 1				
TX Herculis	15.4	+42 00	8.3— 9.0	1 00.7	11 6	17 11	23 15	29 19				
RV Ophiuchi	29.8	+ 7 19	9. —12	3 16.5	4 11	12 20	20 5	27 14				
SZ Herculis	36.0	+33 01	9.5—10.3	0 19.6	1 23	10 6	18 7	26 12				
TX Scorpii	48.6	—34 13	7.5— 8.2	0 22.6	2 23	10 13	18 2	25 15				
UX Herculis	49.7	+16 57	8.8—10.5	1 13.2	5 23	13 17	21 11	29 5				
Z Herculis	53.6	+15 09	7.1— 7.9	3 23.8	2 5	10 5	18 4	26 4				
WX Sagittarii	53.6	—17 24	9.2—10.8	2 03.1	5 6	13 18	22 7	30 19				
WY Sagittarii	17 54.9	—23 01	9.5—10.6	4 16.0	1 1	10 9	19 17	29 1				
SX Draconis	18 03.0	+58 23	9.3—10.5	5 04.1	4 1	14 9	19 13	29 21				
RS Sagittarii	11.0	—34 08	5.9— 6.3	2 10.0	6 4	13 9	20 15	27 21				
V Serpentis	11.1	—15 34	9.5—11.1	3 10.9	5 15	12 12	19 10	26 8				
RZ Scuti	21.1	— 9 15	7.4— 8.3	15 03.2	11 13		26 16					
RZ Draconis	21.8	+58 50	9.5—10.2	0 13.2	7 9	14 13	21 17	28 21				
RX Herculis	26.0	+12 32	7.0— 7.6	0 21.3	2 4	9 6	23 12	30 14				
SX Sagittarii	39.7	—30 36	8.7— 9.8	2 01.8	4 7	12 14	20 21	29 5				
RR Draconis	40.8	+62 34	9.3—13	2 19.9	2 6	10 18	19 6	27 18				
RS Scuti	43.7	—10 21	9.3—10.3	0 15.9	3 23	10 15	23 21	30 15				
β Lyræ	46.4	+33 15	3.4— 4.1	12 21.8	7 7		20 5					
U Scuti	18 48.9	—12 44	9.1— 9.6	0 22.9	7 21	15 12	23 3	30 19				
RX Draconis	19 01.1	+58 35	9.3—10.2	1 21.4	3 0	10 14	18 4	25 18				
RV Lyræ	12.5	+32 15	11. —12.8	3 14.4	3 13	10 18	17 23	25 4				
RS Vulpec.	13.4	+22 16	6.9— 8.0	4 11.4	4 14	13 13	22 12	31 11				
U Sagittæ	14.4	+19 26	6.5— 9.0	3 09.1	1 13	8 7	21 19	28 14				
Z Vulpec.	17.5	+25 23	7.3— 8.5	2 10.9	5 7	12 15	20 0	27 9				
TT Lyræ	24.3	+41 30	9.4—11.6	5 05.8	5 2	15 14	20 20	31 7				
UZ Draconis	26.1	+68 44	9.0— 9.8	1 15.1	2 21	9 10	22 11	28 23				
SY Cygni	19 42.7	+32 28	10. —12	6 00.2	2 7	8 7	20 7	26 8				
WW Cygni	20 00.6	+41 18	9.3—13.4	3 07.6	6 23	13 14	20 6	26 21				
SW Cygni	03.8	+46 01	9. —11.7	4 13.8	2 13	11 16	20 20	29 23				
VW Cygni	11.4	+34 12	9.8—11.8	8 10.3	2 3	10 13	18 23	27 10				
RW Capric.	12.2	—17 59	8.8—10.6	3 09.4	5 21	12 16	19 11	26 6				
UW Cygni	19.6	+42 55	10.5—13	3 10.8	5 15	12 13	19 11	26 8				
V Vulpec.	32.3	+26 15	8.2— 9.8	37 19.0			20 18					
W Delphini	33.1	+17 56	9.4—12.1	4 19.4	2 3	11 17	21 8	30 23				
RR Delphini	38.9	+13 35	10.5—11.8	4 14.4	1 11	10 16	19 21	29 2				
Y Cygni	48.1	+34 17	7.1— 7.9	1 12.0	3 10	12 9	21 9	30 9				
WZ Cygni	49.3	+38 27	9.9—10.8	0 14.0	5 16	13 7	20 21	28 11				
RR Vulpec.	20 50.5	+27 32	9.6—11.0	5 01.2	1 3	10 6	20 8	30 11				
RY Aquarii	21 14.8	—11 14	8.8—10.4	1 23.2	1 1	8 22	16 18	24 15				
UZ Cygni	55.2	+43 52	8.9—11.6	31 07.3			24 23					
RT Lacertæ	21 57.4	+43 24	9.1—10.5	5 01.7	1 20	13 0	17 2	27 5				
RW Lacertæ	22 40.6	+49 08	10.2—11.2	5 04.4	7 0	16 9	21 13	31 22				
VW Pegasi	51.7	+32 42	10.0—10.6	5 06.4	6 3	11 9	21 22	27 5				
Y Piscium	23 29.3	+ 7 22	9.0—12.0	3 18.4	4 14	12 3	19 16	27 4				
TW Androm.	23 58.2	+32 17	8.6—11.5	4 02.9	5 4	13 10	21 16	29 22				

Maxima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract 5h; Central Standard time 6h, etc.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of maxima in 1926 January							
	h m	° ′		d h	d h	d h	d h	d h	d h	d h	d h	d h
SX Cassiop.	0 05.5	+54 20	8.6— 9.2	36 13.7			15 16					
SY Cassiop.	0 09.8	+57 52	9.3— 9.9	4 01.7	7 9		15 13		23 16		31 19	
RR Ceti	1 27.0	+ 0 50	8.3— 9.0	0 13.3	7 4		14 21		22 15		30 9	
RW Cassiop.	1 30.7	+57 15	8.9—11.0	14 19.2	6 5				21 1			
V Arietis	2 09.6	+11 46	8.3— 9.0	0 23.8	6 6		14 4		22 3		30 1	
SU Cassiop.	2 43.0	+68 28	6.5— 7.0	1 22.8	8 3		15 23		23 18		31 13	
RW Camelop.	3 46.2	+58 21	8.2— 9.4	16 00.0	1 3				17 12			
SX Persei	4 10.2	+41 27	10.4—11.2	4 07.0	5 7		13 21		22 11		31 1	
SV Persei	42.8	+42 07	8.8— 9.6	11 03.1	3 13		14 16		25 20			
RX Aurigæ	4 54.5	+39 49	7.2— 8.1	11 15.0	8 11		20 2		31 18			
SX Aurigæ	5 04.6	+42 02	8.0— 8.7	1 12.8	1 12		9 4		16 20		24 12	
SY Aurigæ	05.5	+42 41	8.4— 9.5	10 03.3	8 12		18 15		28 18			
Y Aurigæ	21.5	+42 21	8.6— 9.6	3 20.6	5 14		13 7		21 1		28 17	
RZ Gemin.	5 56.6	+22 15	9.1—10.0	5 12.7	1 20		12 21		18 10		29 12	
RS Orionis	6 16.5	+14 44	8.2— 8.9	7 13.6	1 12		9 2		24 5		31 19	
T Monoc.	19.8	+ 7 08	5.7— 6.8	27 00.3	1 6				28 6			
RT Aurigæ	23.0	+30 33	5.1— 6.0	3 17.5	2 6		9 17		17 3		24 15	
W Gemin.	29.2	+15 24	6.7— 7.5	7 22.0	7 10		15 8		23 6		31 4	
ξ Gemin.	6 58.2	+20 43	3.7— 4.3	10 03.7	3 3		13 7		23 11			
RU Camelop.	7 10.9	+69 51	8.5— 9.8	22 06.5	8 5				30 12			
RR Gemin.	7 15.2	+31 04	10.0—11.5	0 09.5	7 6		15 4		23 3		31 2	
V Carinae	8 26.7	—59 47	7.4— 8.1	6 16.7	4 23		11 15		25 1		31 17	
T Velorum	8 34.4	—47 01	7.6— 8.5	4 15.3	3 17		13 1		22 7		31 13	
V Velorum	9 19.2	—55 32	7.5— 8.2	4 08.9	8 11		17 5		25 23			
Z Leonis	9 46.4	+27 22	7.9— 9.6	56 08.7					25 22			
RR Leonis	10 02.1	+24 29	9.1—10.1	0 10.9	5 21		12 16		19 10		26 5	
SU Draconis	11 32.2	+67 53	8.9— 9.6	0 15.8	7 8		13 23		20 13		27 4	
S Muscae	12 07.4	—69 36	6.4— 7.3	9 15.8	6 12		16 4		25 20			
SW Draconis	12.8	+70 04	8.8— 9.6	0 13.7	7 2		15 1		23 1		31 1	
T Crucis	15.9	—61 44	6.8— 7.6	6 17.6	5 5		11 23		18 17		25 10	
R Crucis	18.1	—61 04	6.8— 7.9	5 19.8	6 9		12 5		23 21		29 17	
S Crucis	12 48.4	—57 53	6.5— 7.6	4 16.6	3 18		13 3		22 12		31 22	
W Virginis	13 20.9	— 2 52	8.7—10.4	17 06.5	8 4				23 11			
SS Hydræ	25.0	—23 08	7.4— 8.1	8 04.8	5 12		13 17		21 22		29 2	
RV Urs. Maj.	13 29.4	+54 31	9.2— 9.9	0 11.2	8 18		15 18		22 19		29 19	
ST Virginis	14 22.5	— 0 27	10.3—11.4	0 09.9	7 3		14 13		21 23		29 8	
V Centauri	25.4	—56 27	6.4— 7.8	5 11.9	3 13		14 13		20 1		31 0	
RS Bootis	29.3	+32 11	8.9—10.0	0 09.1	7 6		14 19		22 8		29 21	
R Triang.Austr.	15 10.8	—66 08	6.7— 7.4	3 09.3	2 23		9 17		23 10		30 1	
S Triang.Austr.	15 52.2	—63 29	6.4— 7.4	6 07.8	5 5		11 13		24 4		30 12	
S Normæ	16 10.6	—57 39	6.6— 7.6	9 18.1	3 3		12 21		22 15			
RW Draconis	33.7	+58 03	9.6—10.8	0 10.6	5 9		14 5		23 2		31 23	
RV Scorpii	16 51.8	—33 27	6.7— 7.4	6 01.5	3 23		10 1		22 3		28 5	
X Sagittarii	17 41.3	—27 48	4.4— 5.0	7 00.3	5 11		12 12		19 12		26 12	
Y Ophiuchi	47.3	— 6 07	6.1— 6.5	17 02.9			15 9					
W Sagittarii	17 58.6	—29 35	4.3— 5.1	7 14.3	1 8		8 23		24 3		31 17	
Y Sagittarii	18 15.5	—18 54	5.4— 6.2	5 18.6	6 12		12 7		23 20		29 14	
U Sagittarii	26.0	—19 12	6.5— 7.3	6 17.9	3 23		10 17		24 5		30 23	
Y Scuti	32.6	— 8 27	8.7— 9.2	10 08.3	6 22		17 7		27 15			
RZ Lyræ	39.9	+32 42	9.9—11.2	0 12.3	8 16		16 8		24 0		31 16	
RT Scuti	18 44.1	—10 30	9.1— 9.7	0 11.9	1 9		8 19		16 6		23 16	
κ Pavonis	18 46.6	—67 22	3.8— 5.2	9 02.2	5 15		14 17		23 19			
U Aquilæ	19 24.0	— 7 15	6.2— 6.9	7 00.6	4 14		11 15		18 15		25 16	

Maxima of Variable Stars of Short Period—Continued.

Star	R.A. 1900		Decl. 1900		Magnitude	Approx. Period		Greenwich civil times of maxima in 1926 January							
	h	m	°	′		d	h	d	h	d	h	d	h	d	h
XZ Cygni	19	30.4	+56	10	8.6— 9.3	0	11.2	4	5	11	5	18	5	25	5
U Vulpec.		32.2	+20	07	6.5 - 7.6	7	23.5	2	22	10	22	18	21	26	21
SU Cygni		40.8	+29	01	6.2— 7.0	3	20.3	1	6	8	23	16	15	24	8
η Aquilæ		47.4	+ 0	45	3.7— 4.5	7	04.2	7	1	14	4	21	8	29	13
S Sagittæ		51.5	+16	22	5.6— 6.4	8	09.2	7	6	15	15	24	0		
X Vulpec.	19	53.3	+26	17	9.5—10.5	6	07.7	6	21	13	5	19	12	25	20
X Cygni	20	39.5	+35	14	6.0— 7.0	16	09.3			12	10			28	20
T Vulpec.		47.2	+27	52	5.5— 6.1	4	10.5	1	21	10	17	19	14	28	11
UY Cygni		52.3	+30	03	9.6—10.4	0	13.5	4	3	11	10	18	17	24	23
RV Capric.		55.9	—15	37	9.2—10.1	0	10.7	2	10	9	14	23	21	31	1
TX Cygni	20	56.4	+42	12	8.5— 9.7	14	17.4			11	19			26	12
VY Cygni	21	00.4	+39	34	8.8— 9.5	7	20.6	5	12	13	9	21	5	29	2
SW Aquarii		10.2	— 0	20	9.9—10.8	0	11.0	2	15	9	13	23	7	30	5
VZ Cygni	21	47.7	+42	40	8.2— 9.2	4	20.7	7	15	17	8	22	5	31	22
Y Lacertæ	22	05.2	+50	33	9.1— 9.6	4	07.8			12	6	20	22	29	13
δ Cephei		25.5	+57	54	3.7— 4.6	5	08.8	6	11	11	19	22	13	27	22
Z Lacertæ		36.9	+56	18	8.2— 9.0	10	21.1	4	11	15	9	26	6		
RR Lacertæ		37.5	+55	55	8.5— 9.2	6	10.1	3	12	9	22	22	18	29	4
V Lacertæ		44.5	+55	48	8.5— 9.5	4	23.6	1	1	10	0	19	23	29	23
X Lacertæ	22	45.0	+55	54	8.2— 8.6	5	10.7	4	9	15	6	20	17	31	14
SW Cassiop.	23	03.7	+58	11	9.2— 9.7	5	10.6	1	5	12	2	17	13	28	10
RS Cassiop		32.6	+61	52	9.0—11.0	6	07.1	1	20	8	3	20	18	27	1
RY Cassio.		47.2	+58	11	9.3—11.8	12	03.4			11	5	23	7		
V Cephei	23	51.7	+82	38	6.0— 7.0	0	23.9	4	4	9	3	18	3	25	2

Monthly Report of the American Association of Variable Star Observers, October, 1925.

The annual meeting of the Association at Cambridge, held on October 17, passed off as scheduled. Although the faces of some of the "Old Guard" were among the missing, the affair proved to be a lively one, with plenty of real enthusiasm in evidence.

It was voted to adopt the plan of reverting to the former method of expressing Julian Day and decimal, *i. e.*, referring all observations to Greenwich mean noon instead of to midnight, as has been the custom during the past year. This change will go into effect with the preparation of the records for next month's report to appear in the January issue of Popular Astronomy.

At the suggestion of Dr. Shapley, a committee was appointed to consider the matter of securing observations on some of the more important Cepheid variables. This means a further extension of our activities, something well worth while, with our greater experience and expansion.

Secretary Olcott gave a very interesting account of his experiences at the recent I. A. U. meeting. Professor Stetson described his plans for the coming solar eclipse in Sumatra on January 14, 1926.

The Constitution was revised so as to permit Past Presidents of the Association to serve on the Council with full powers of elected Council Members. The annual election of Council Members, and later the Officers therefrom, resulted as follows: (See page 687).

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925.

Aug. 0 = J. D. 2424363 Sept. 0 = J. D. 2424394 Oct. 0 = J. D. 2424424

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
000339 V SCULPTORIS—						
	4370.6	10.7	Bl			
001032 S SCULPTORIS—						
	4370.6	10.3	Bl	4382.8	10.0	Sm
	4375.8	10.5	Sm	4387.8	9.7	Ht
	4381.8	9.7	Ht	4430.1	8.8	Bh
001046 X ANDROMEDAE—						
	4414.3	9.1	Wf	4428.3	9.4	Wf
	4425.1	9.7	B	4436.3	9.7	Wf
001726 T ANDROMEDAE—						
	4390.7	9.2	Ch	4420.1	9.2	Jo
	4416.1	8.9	Jo	4427.1	9.3	B
	4418.1	9.0	Jo	4438.1	9.9	Jo
	4419.3	9.1	Bi	4439.2	9.5	Pt
001755 T CASSIOPEIAE—						
	4381.2	10.5	Sg	4420.1	9.5	B
	4390.7	10.3	Ch	4430.1	9.7	Du
	4399.2	10.6	Sg	4433.1	9.5	B
	4414.1	9.1	Jo	4438.2	9.8	Du
	4416.1	9.0	Jo	4438.1	9.0	Jo
	4418.1	8.9	Jo	4439.2	9.0	Pt
	4420.1	9.0	Jo			
001838 R ANDROMEDAE—						
	4390.7	10.8	Ch	4428.3	12.0	Wf
	4408.9	11.4	Lp	4432.9	12.6	Lp
	4414.1	11.5	Gb	4435.3	12.0	Cy
	4414.4	11.6	Wf	4436.0	12.1	B
	4415.9	11.6	Lp	4438.2	12.0	Wf
	4416.1	11.5	B	4439.2	11.6	Pt
	4417.3	11.9	Wf			
001862 S TUCANAE—						
	4370.6	9.6	Bl	4385.8	10.7	Sm
	4378.8	10.2	Sm			
001909 S CETI—						
	4390.7	9.0	Ch	4439.2	10.5	Pt
	4403.7	9.2	Ch			
002546 T PHOENICIS—						
	4375.5	[13.6	Bl			
002833 W SCULPTORIS—						
	4375.5	13.0	Bl			
004047 U CASSIOPEIAE—						
	4414.4	8.6	Wf	4433.1	9.4	B
	4425.1	8.7	B	4436.3	10.0	Wf
	4428.3	9.2	Wf	4439.2	9.8	Pt
004132 RW CASSIOPEIAE—						
	4414.3	[13.7	Br	4439.0	[13.0	B
004435 X SCULPTORIS—						
	4375.6	13.2	Bl			
004435 V ANDROMEDAE—						
	4416.1	10.7	B	4432.1	9.6	B
	4419.3	10.1	Bi			
004533 RR ANDROMEDAE—						
	4414.4	9.9	Wf	4436.0	11.0	B
	4420.1	10.1	B	4436.3	10.9	Wf
	4428.3	10.4	Wf			
004746a RV CASSIOPEIAE—						
	4414.3	8.8	Br	4433.1	9.2	B
	4414.4	8.4	Wf	4436.3	9.4	Wf
	4420.1	8.7	B	4439.2	9.5	Pt
	4428.3	9.0	Wf			
004746b — CASSIOPEIAE—						
	4414.4	10.7	Wf	4436.3	10.7	Wf
	4428.3	10.5	Wf	4439.2	10.7	Pt
004958 W CASSIOPEIAE—						
	4408.9	9.4	Lp	4432.9	10.5	Lp
	4420.1	9.0	B	4433.1	9.1	B
	4430.1	9.5	Du	4439.2	9.0	Pt
005475 U TUCANAE—						
	4370.6	9.8	Bl			
005840 RX ANDROMEDAE—						
	4414.2	13.5	Br	4434.2	[12.6	Pt
	4415.2	13.7	Br	4437.2	[11.7	Pt
	4415.2	[12.6	Pt	4439.2	[12.6	Pt
	4416.2	[12.6	Pt	4441.2	[11.3	Pt
	4418.2	[12.6	Pt	4442.2	11.4	Pt
	4431.2	11.5	Pt	4443.2	10.9	Pt
	4433.2	[12.6	Pt	4444.2	11.5	Pt
010102 Z CETI—						
	4414.2	12.8	B	4439.2	10.8	Pt
	4431.1	11.0	B	4440.1	11.1	B
010630 U SCULPTORIS—						
	4370.6	10.8	Bl			
010940 U ANDROMEDAE—						
	4414.1	13.6	B	4430.1	14.3	Wf
	4414.4	14.1	Wf	4436.3	14.3	Wf
011041 UZ ANDROMEDAE—						
	4414.4	10.3	Wf	4432.1	10.0	B
	4416.2	10.0	B	4436.4	10.5	Wf
	4428.3	10.1	Wf			
011208 S PISCIUM—						
	4414.3	14.0	Br			
011272 S CASSIOPEIAE—						
	4408.9	11.7	Lp	4432.1	11.8	B
	4414.4	11.7	Wf	4433.8	11.9	Lp
	4416.2	11.9	B	4436.4	12.5	Wf
	4417.3	12.1	Wf	4438.2	12.5	Wf
	4428.3	12.2	Wf	4439.2	12.6	Pt
	4430.1	12.1	Du			
011712 U PISCIUM—						
	4414.3	13.7	Br	4439.2	14.2	Pt
012350 RZ PERSEI—						
	4414.1	13.2	B	4438.1	12.0	B
012502 R PISCIUM—						
	4411.7	[11.8	Ch	4414.4	13.7	Br
013238 RU ANDROMEDAE—						
	4408.3	14.2	Wf	4436.4	13.6	Wf
	4414.4	14.2	Wf	4438.1	13.4	B
	4430.2	13.9	Wf	4439.2	13.5	Pt
013338 Y CASSIOPEIAE—						
	4414.1	13.5	B	4439.2	13.9	Pt
	4438.1	13.9	B			
014958 X CASSIOPEIAE—						
	4416.2	10.6	B	4439.2	11.6	Pt
	4432.1	10.6	B			
015354 U PERSEI—						
	4420.1	8.7	B	4439.2	8.9	Pt
	4432.2	9.2	B			
015912 S ARIETIS—						
	4414.2	9.8	B	4439.1	10.4	B
	4431.1	10.2	B	4439.2	10.2	Pt

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
021024 R ARIETIS—						
	4408.9	12.0	Lp	4430.3	10.4	Wf
	4414.2	12.1	B	4431.1	10.5	B
	4414.4	12.3	Wf	4432.9	10.8	Lp
	4415.9	12.3	Lp	4435.3	10.3	Cy
	4417.3	12.0	Wf	4436.3	9.9	Wf
	4417.9	11.9	Lp	4438.2	9.9	Wf
	4419.3	11.3	Bi	4440.1	9.3	E
	4421.7	10.8	Mb			
021143a W ANDROMEDAE—						
	4414.2	12.3	B	4436.4	11.5	Wf
	4414.4	12.1	Wf	4438.2	11.6	Wf
	4417.3	11.9	Wf	4439.2	11.5	B
	4430.4	11.8	Wf	4439.2	11.7	Pt
	4431.2	11.8	B			
021258 T PERSEI—						
	4410.7	9.1	Ch	4443.4	8.5	Pt
021281 Z CEPHEI—						
	4414.4	15.2	Wf	4437.2	15.4	Wf
	4432.1	15.5	Wf	4438.2	[15.2	Wf
021403 o CETI—						
	4411.4	8.4	Cy	4430.4	6.9	Wf
	4414.2	7.8	Bh	4432.9	6.7	Lp
	4414.4	8.3	Wf	4435.3	6.9	Cy
	4415.7	8.4	Ch	4436.4	6.5	Wf
	4417.3	7.9	Wf	4440.3	6.0	Jo
	4419.2	7.5	Gb	4443.4	5.3	Pt
	4427.4	6.9	Wf	4444.3	5.7	Jo
021558 S PERSEI—						
	4408.9	10.9	Lp	4433.9	10.4	Lp
	4410.7	10.5	Ch	4443.4	9.9	Pt
	4417.9	10.9	Lp			
022000 R CETI—						
	4410.7	10.0	Ch			
022150 RR PERSEI—						
	4414.4	14.2	Br	4432.1	14.6	Wf
	4414.4	14.2	Wf	4438.2	14.8	Wf
022426 R FORNACIS—						
	4370.6	10.8	Bl			
022813 U CETI—						
	4411.8	12.5	Ch	4443.4	12.6	Pt
022980 RR CEPHEI—						
	4414.4	10.6	Wf	4436.4	11.6	Wf
	4430.4	10.5	Wf	4443.4	10.4	Pt
023133 R TRIANGULI—						
	4411.7	5.8	Ch	4432.1	7.1	B
	4416.2	6.0	Jo	4435.3	7.3	Cy
	4419.3	6.2	Bi	4438.1	7.0	Jo
	4420.2	5.9	Jo	4440.2	7.2	Jo
	4432.1	7.1	B	4443.4	7.5	Pt
024356 W PERSEI—						
	4411.4	9.5	Cy	4435.3	9.0	Cy
	4420.2	9.1	B	4443.4	8.9	Pt
	4432.2	9.0	B			
025050 R HOROLOGII—						
	4370.6	11.7	Bl	4385.9	11.7	Sm
025751 T HOROLOGII—						
	4370.6	8.3	Bl	4385.9	8.7	Sm
030514 U ARIETIS—						
	4414.4	12.3	Br	4438.2	13.8	B
031401 X CETI—						
	4414.4	12.1	Wf	4436.4	12.2	Wf
	4414.4	12.0	Br	4443.4	12.0	Pt
	4430.4	12.4	Wf			
032043 Y PERSEI—						
	4414.1	10.0	Gb	4442.4	8.7	Pt
033235 R PERSEI—						
	4414.4	11.4	Wf	4433.0	12.6	Lp
	4415.9	11.5	Lp	4436.4	12.8	Wf
	4417.3	11.8	Wf	4438.2	12.9	Wf
	4417.9	11.7	Lp	4443.4	13.0	Pt
	4428.4	12.4	Wf			
042209 R TAURI—						
	4414.4	14.0	Br	4443.4	13.6	Pt
042215 W TAURI—						
	4411.4	10.0	Cy	4435.3	10.6	Cy
042309 S TAURI—						
	4443.4	13.3	Pt			
043065 T CAMELOPARDALIS—						
	4443.4	10.6	Pt			
043208 RX TAURI—						
	4414.4	13.5	Br			
043263 R RETICULI—						
	4385.9	10.1	Sm			
043274 X CAMELOPARDALIS—						
	4414.1	8.8	Gb	4443.4	11.8	Pt
044349 R PICTORIS—						
	4370.6	8.0	Bl			
044617 V TAURI—						
	4413.8	10.0	Ch	4428.3	10.2	Wf
	4414.4	10.2	Br	4433.0	10.9	Lp
	4414.4	9.9	Wf	4436.4	10.6	Wf
	4417.3	10.0	Wf	4438.2	10.8	Wf
045514 R LEPORIS—						
	4416.4	9.0	Bh	4443.4	8.7	Pt
	4440.3	9.2	Jo	4444.3	9.0	Jo
050003 V ORIONIS—						
	4414.4	9.2	Br	4443.4	9.9	Pt
050032 T LEPORIS—						
	4443.4	10.0	Pt			
050953 R AURIGAE—						
	4414.4	9.5	Wf	4436.4	9.6	Wf
	4417.3	9.6	Wf	4438.2	9.8	Wf
	4419.3	9.3	Bi	4444.2	9.8	Pt
	4430.4	9.7	Wf			
052034 S AURIGAE—						
	4444.2	9.0	Pt			
052036 W AURIGAE—						
	4414.4	[14.6	Br	4415.5	[14.6	Br
052404 S ORIONIS—						
	4414.5	12.0	Br	4444.2	10.7	Pt
053005a T ORIONIS—						
	4405.7	10.8	Kk	4434.2	10.2	Pt
	4418.2	10.1	Pt	4440.3	10.1	Pt
	4421.2	10.0	Pt	4443.4	10.2	Pt
	4431.2	10.3	Pt	4444.2	10.1	Pt
	4433.2	10.2	Pt			
053068 S CAMELOPARDALIS—						
	4444.2	8.5	Pt			
053337 RU AURIGAE—						
	4414.4	11.9	Br			

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
054319 SU TAURI—						
	4408.4	9.5	Wf	4427.4	9.5	Wf
	4414.4	9.8	Wf	4428.3	9.4	Wf
	4414.4	9.5	Br	4430.4	9.5	Wf
	4415.3	9.7	Wf	4433.2	9.5	Pt
	4415.3	9.5	Br	4434.2	9.5	Pt
	4416.3	9.6	Wf	4436.4	9.6	Wf
	4417.6	9.4	Wf	4440.3	9.5	Pt
	4418.2	9.6	Pt	4442.2	9.5	Pt
	4418.4	9.8	Wf	4443.2	9.5	Pt
	4421.2	9.6	Pt	4444.2	9.5	Pt
	4426.3	9.4	Wf			
054920a U ORIONIS—						
	4419.2	8.0	Gb	4440.3	7.7	Jo
	4435.3	7.6	Cy	4444.2	8.0	Pt
	4439.2	8.0	Gb	4444.3	7.6	Jo
054920b UW ORIONIS—						
	4411.4	10.5	Cy	4435.3	10.6	Cy
054974 V CAMELOPARDALIS—						
	4408.4	[15.2	Wf	4432.2	14.9	Wf
	4414.4	15.2	Wf	4437.2	14.7	Wf
	4417.3	[14.5	Wf	4438.2	14.8	Wf
	4430.1	14.9	Wf			
055353 Z AURIGAE—						
	4414.4	11.2	Wf	4431.2	11.0	Pt
	4415.2	11.1	Pt	4433.2	10.8	Pt
	4428.4	11.1	Wf	4440.2	10.8	Pt
	4431.2	11.0	Pt	4442.2	10.8	Pt
055686 R OCTANTIS—						
	4370.4	[12.0	Bl	4382.7	[11.6	Sm
060547 SS AURIGAE—						
	4408.3	[14.5	Wf	4436.2	[13.9	Wf
	4411.4	[12.4	Cy	4430.2	[12.6	Du
	4414.4	15.2	Wf	4431.2	[12.4	Pt
	4414.4	[13.9	Br	4432.2	[13.0	Du
	4415.2	15.2	Wf	4433.0	[12.4	Lp
	4415.5	13.9	Br	4433.2	[12.4	Pt
	4416.2	[12.6	Pt	4434.2	[12.4	Pt
	4416.3	[13.9	Wf	4435.3	[12.4	Cy
	4417.3	15.5	Wf	4436.4	15.2	Wf
	4418.2	[12.6	Pt	4437.2	15.0	Wf
	4418.3	[15.0	Wf	4438.2	15.0	Wf
	4419.3	[14.0	Bi	4438.3	15.2	Du
	4421.2	11.0	Pt	4440.3	[12.6	Pt
	4426.3	15.5	Wf	4442.2	[12.6	Pt
	4427.4	[13.0	Wf	4444.2	[12.6	Pt
	4428.3	[13.3	Wf			
063462 NOVA PICTORIS—						
	4328.5	3.3	To	4370.4	2.2	To
	4330.4	3.3	To	4370.4	2.6	Bl
	4331.4	3.4	To	4370.7	3.3	Sm
	4332.4	3.4	To	4371.4	1.9	To
	4333.8	3.4	To	4371.4	2.3	Bl
	4334.4	3.3	To	4372.4	1.9	Bl
	4335.4	3.4	To	4372.4	1.8	To
	4337.3	3.4	To	4374.4	2.0	To
	4338.4	3.4	To	4374.4	2.1	Bl
	4341.5	3.3	To	4376.4	2.6	Bl
	4342.4	3.2	To	4376.4	2.7	To
	4343.5	3.2	To	4378.7	3.2	Sm
	4344.4	3.1	To	4380.4	2.8	To

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
063462 NOVA PICTORIS—Continued.						
	4346.4	3.2	To	4381.4	2.9	To
	4347.4	3.0	To	4381.5	3.0	Bl
	4350.4	2.7	To	4382.4	2.9	To
	4351.4	2.7	To	4382.4	2.9	Bl
	4358.8	1.9	To	4382.7	3.2	Sm
	4359.4	1.4	To	4383.5	3.1	To
	4361.4	1.8	To	4384.5	3.1	To
	4362.4	2.2	To	4385.4	3.1	Bl
	4365.2	3.2	Sm	4385.5	2.9	To
	4365.4	2.4	To	4385.7	3.2	Sm
	4365.4	3.0	Bl	4386.4	3.0	To
	4366.2	3.2	Sm	4387.5	3.1	To
	4366.4	2.4	To	4388.3	3.2	Sm
	4366.8	2.6	To	4388.4	3.0	To
	4366.8	3.3	Sm	4388.4	3.1	Bl
	4367.4	3.3	Bl	4389.4	3.0	To
	4367.7	3.3	Sm	4389.8	3.4	To
	4368.4	3.3	Bl			
064030 X GEMINORUM—						
	4414.5	11.7	Br			
065355 R LYNCIS—						
	4414.4	9.4	Wf	4436.4	10.2	Wf
	4417.3	9.7	Wf	4438.2	10.4	Wf
	4430.4	9.8	Wf			
070122a R GEMINORUM—						
	4414.4	8.6	Wf	4428.4	7.2	Wf
	4414.5	8.8	Br	4436.4	7.1	Wf
	4418.5	8.0	Wf			
070772 R VOLANTIS—						
	4370.7	[12.6	Sm	4382.7	[11.8	Sm
071044 L PUPPIS—						
	4429.4	3.5	Bh			
072708 S CANIS MINORIS—						
	4435.3	12.0	Cy			
073173 S VOLANTIS—						
	4374.4	[13.2	Bl			
073723 S GEMINORUM—						
	4414.5	13.7	Br			
074323 T GEMINORUM—						
	4414.5	[14.0	Br			
074922 U GEMINORUM—						
	4411.4	[12.4	Cy	4430.4	[13.3	Wf
	4414.4	14.1	Wf	4434.3	[10.6	Du
	4414.5	14.0	Br	4435.3	14.0	Du
	4418.5	[13.7	Wf	4436.4	13.9	Wf
	4427.4	12.8	Wf	4438.3	14.0	Du
	4427.4	12.7	Wf			
082476 R CHAMAELEONTIS—						
	4370.7	10.6	Sm	4381.4	10.0	Bl
	4370.4	10.0	Bl	4385.8	10.6	Sm
	4378.7	10.2	Sm			
083019 U CANCRI—						
	4414.4	13.3	Wf	4336.4	13.1	Wf
090425 W CANCRI—						
	4414.5	14.3	Wf	4436.4	14.3	Wf
091868 RW CARINAE—						
	4374.4	[12.8	Bl			
092551 Y VELORUM—						
	4370.4	9.2	Bl	4375.4	9.1	Bl
	4370.7	9.5	Sm	4381.4	8.7	Bl

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
092962 R CARINAE—						
	4369.7	6.6	Ht	4375.7	6.3	Ht
	4370.4	6.3	Bl	4375.5	6.0	Sm
	4370.7	6.6	Sm	4381.4	5.7	Bl
093178 Y DRACONIS—						
	4417.0	13.4	Y			
094053 Z VELORUM—						
	4369.7	[11.9	Ht	4375.4	[12.8	Bl
	4370.7	[12.1	Sm	4375.7	[11.9	Ht
095421 V LEONIS—						
	4436.4	11.2	Wf			
095563 RV CARINAE—						
	4375.4	[13.1	Bl			
100661 S CARINAE—						
	4369.7	7.5	Ht	4378.7	8.0	Sm
	4370.4	7.0	Bl	4381.4	8.1	Bl
	4370.7	7.2	Sm	4381.7	8.7	Ht
	4375.7	8.0	Ht	4382.7	8.0	Sm
	4375.7	7.3	Sm			
101058 Z CARINAE—						
	4375.7	[11.8	Sm	4375.4	[12.6	Bl
101153 W VELORUM—						
	4375.4	12.5	Bl			
103769 R URSAE MAJORIS—						
	4401.2	12.4	Sg	4436.2	8.7	Wf
	4415.2	10.7	Wf	4438.1	8.3	Wf
	4418.2	10.4	Wf	4439.2	8.3	Gb
	4428.2	9.3	Wf	4442.2	8.2	Gb
	4435.1	8.2	Cy			
104630 V HYDRAE—						
	4370.4	10.9	Bl			
104638 RS HYDRAE—						
	4370.4	10.6	Bl	4381.4	10.9	Bl
110361 RS CARINAE—						
	4370.7	[12.3	Sm			
111561 RY CARINAE—						
	4375.4	[13.1	Bl			
111661 RS CENTAURI—						
	4370.4	9.0	Bl	4378.7	9.5	Sm
	4370.7	9.2	Sm	4381.4	8.9	Bl
	4375.7	9.2	Sm	4382.7	9.2	Sm
114441 X CENTAURI—						
	4370.4	8.3	Bl	4381.4	8.5	Bl
115058 W CENTAURI—						
	4375.4	[12.6	Bl			
122854 U CENTAURI—						
	4370.4	11.3	Bl	4381.4	11.8	Bl
123160 T URSAE MAJORIS—						
	4381.2	8.3	Sg	4415.9	10.7	Lp
	4388.1	8.5	Wb	4418.2	10.3	Wf
	4405.5	10.0	Ik	4428.2	10.8	Wf
	4403.2	9.5	Sg	4432.9	11.7	Lp
	4415.2	10.2	Wf	4436.2	11.3	Wf
	4415.2	10.6	Pt	4438.1	12.0	Wf
123459 RS URSAE MAJORIS—						
	4381.2	[12.6	Sg	4416.2	14.3	Wf
	4403.2	[12.2	Sg	4430.1	13.3	Wf
	4415.2	13.4	Pt	4436.3	12.8	Wf
	4415.2	[13.2	Wf			
123961 T URSAE MAJORIS—						
	4381.2	11.3	Sg	4430.5	9.3	Ik
	4403.2	11.0	Sg	4432.8	8.4	Kb
	4414.5	9.5	Ik	4432.9	8.8	Lp
	4415.2	9.8	Wf	4433.8	8.4	Kb
	4415.2	9.5	Pt	4434.8	8.4	Kb
	4415.9	10.5	Lp	4436.3	8.5	Wf
	4417.2	9.3	Wf	4436.8	8.3	Kb
	4427.8	9.1	Lp	4438.1	8.6	Wf
	4428.2	8.7	Wf	4440.8	8.1	Kb
	4429.1	8.6	Bh			
131283 U OCTANTIS—						
	4370.4	10.0	Bl	4381.4	10.4	Bl
	4370.8	10.2	Sm	4385.9	11.0	Sm
	4378.7	10.5	Sm			
132422 R HYDRAE—						
	4370.4	6.1	Bl	4381.5	7.5	Bl
	4370.8	6.7	Sm	4382.7	6.7	Sm
	4375.8	6.6	Sm			
132706 S VIRGINIS—						
	4370.7	9.5	Sm	4378.8	9.6	Sm
	4375.8	9.5	Sm	4382.7	9.6	Sm
133155 RV CENTAURI—						
	4370.4	7.5	Bl	4381.4	7.5	Bl
133273 T URSAE MINORIS—						
	4408.3	14.7	Wf	4430.1	14.0	Wf
	4417.2	14.5	Wf	4436.3	13.9	Wf
133633 T CENTAURI—						
	4365.8	7.9	Sm	4378.8	7.8	Sm
	4369.7	7.9	Ht	4381.5	7.2	Bl
	4370.4	7.8	Bl	4381.7	7.4	Ht
	4370.8	8.2	Sm	4382.8	7.2	Sm
	4371.7	8.0	Ht	4385.8	6.8	Sm
	4375.7	8.2	Ht	4387.7	7.1	Ht
	4375.8	8.0	Sm	4394.7	6.2	Ht
134236 RT CENTAURI—						
	4375.4	12.0	Bl	4381.5	11.0	Bl
134440 R CANUM VENATICORUM—						
	4406.9	9.3	Kb	4432.8	8.5	Kb
	4408.9	9.3	Lp	4433.8	8.4	Kb
	4415.2	8.6	Pt	4433.8	8.0	Lp
	4421.9	8.6	Kb	4434.8	8.4	Kb
	4422.9	8.7	Kb	4436.8	8.3	Kb
	4430.8	8.5	Kb	4440.8	8.0	Kb
134536 RX CENTAURI—						
	4370.4	9.6	Bl	4381.5	9.4	Bl
134677 T APODIS—						
	4370.4	8.3	Bl	4375.8	8.8	Sm
	4370.8	8.8	Sm	4381.5	8.6	Bl
	4375.4	8.5	Bl	4382.8	8.9	Sm
140113 Z BOOTIS—						
	4416.1	[14.4	Wf	4438.1	13.4	Wf
	4430.1	13.7	Wf			
140528 RU HYDRAE—						
	4375.4	[13.5	Bl	4385.8	[12.5	Sm
	4375.8	[12.0	Sm			
140959 R CENTAURI—						
	4369.7	8.7	Ht	4381.5	8.5	Bl
	4370.4	8.0	Bl	4381.7	9.5	Ht
	4370.8	8.7	Sm	4382.8	8.9	Sm

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
140959 R CENTAURI—Continued.						
	4375.7	9.2	Ht	4387.7	9.5	Ht
	4375.8	8.6	Sm	4394.7	9.9	Ht
141567 U URSAE MINORIS—						
	4388.2	10.9	Wb	4415.6	10.1	Ch
	4415.2	10.0	Pt			
141954 S BOOTIS—						
	4335.1	11.2	Cy	4415.6	9.9	Ch
	4387.2	8.6	Sg	4417.0	9.9	Y
	4399.2	8.9	Sg	4417.2	10.0	Wf
	4414.1	9.8	Gb	4428.2	10.4	Wf
	4415.2	10.0	Pt	4436.3	11.5	Wf
	4415.3	10.0	Wf	4438.1	11.6	Wf
142539 V BOOTIS—						
	4387.2	9.0	Sg	4415.2	7.8	Pt
	4409.1	8.1	Cy	4415.6	8.1	Ch
	4413.1	8.3	Bh	4431.1	8.0	Gb
	4413.1	8.1	Cy	4432.9	7.6	Lp
	4414.1	8.0	Gb	4435.1	7.8	Cy
142584 R CAMELOPARDALIS—						
	4415.3	13.0	Wf	4432.1	14.0	Wf
	4417.2	13.3	Wf	4436.3	14.2	Wf
	4428.2	13.7	Wf	4438.1	14.3	Wf
	4430.2	12.9	Du	4438.1	13.5	Du
143227 R BOOTIS—						
	4385.2	6.9	Sg	4415.2	7.8	Pt
	4403.2	7.6	Sg	4415.6	8.0	Ch
	4413.1	8.2	Bh	4435.1	9.3	Cy
	4415.1	8.2	Gb			
144918 U BOOTIS—						
	4434.9	11.9	Cy			
145254 Y LUPI—						
	4375.4	13.0	Bl	4385.8	[12.4	Sm
	4378.8	[12.4	Sm			
145971 S APODIS—						
	4370.4	9.7	Bl	4378.8	10.4	Sm
	4370.8	10.4	Sm	4381.5	9.8	Bl
	4375.8	10.4	Sm	4382.8	10.4	Sm
151714 S SERPENTIS—						
	4415.2	9.0	Pt	4434.9	8.5	Cy
	4416.1	8.9	Wf	4437.1	10.0	Wf
	4428.2	9.5	Wf			
151731 S CORONAE BOREALIS—						
	4387.2	12.5	Sg	4417.0	12.2	Y
	4402.2	12.3	Sg	4428.2	11.8	Wf
	4411.0	11.7	B	4430.0	10.8	B
	4415.2	11.5	Pt	4435.1	10.7	Cy
	4415.6	11.6	Ch	4437.1	10.3	Wf
	4416.1	11.7	Wf			
151822 RS LIBRAE—						
	4369.8	11.7	Ht	4381.5	11.9	Bl
	4370.5	11.5	Bl	4381.7	12.1	Ht
	4375.8	11.9	Ht	4382.8	12.0	Sm
	4375.8	11.7	Sm	4387.8	12.1	Ht
152849 R NORMAE—						
	4370.5	8.0	Bl	4382.8	7.3	Sm
	4370.8	8.5	Sm	4385.4	7.0	Bl
	4375.8	7.5	Sm	4385.8	7.2	Sm
	4378.8	7.5	Sm			
153020 X LIBRAE—						
	4370.5	11.3	Bl	4385.4	12.2	Bl
153215 W LIBRAE—						
	4375.4	[13.5	Bl			
153378 S URSAE MINORIS—						
	4387.2	12.8	Sg	4430.1	11.5	Du
	4415.2	11.2	Pt	4435.1	11.5	Cy
	4415.3	12.0	Wf	4436.3	11.4	Wf
	4417.2	12.2	Wf	4438.1	11.3	Du
	4428.2	11.6	Wf	4438.2	11.4	Wf
153620a U LIBRAE—						
	4370.5	10.0	Bl	4385.4	10.1	Bl
153654 T NORMAE—						
	4369.7	[12.8	Ht	4381.7	[12.8	Ht
	4375.7	[12.8	Ht	4385.8	[12.2	Sm
	4378.8	[12.2	Sm	4387.7	[12.8	Ht
154020 Z LIBRAE—						
	4375.4	13.2	Bl	4385.4	12.3	Bl
154428 R CORONAE BOREALIS—						
	4369.2	6.0	Pj	4421.2	6.2	Pt
	4370.2	5.9	Pj	4421.9	5.9	Kb
	4381.2	6.0	Sg	4422.2	6.2	Pt
	4385.2	6.0	Sg	4422.9	6.0	Kb
	4388.7	5.9	Ch	4423.1	6.1	Bh
	4390.7	6.1	Ch	4426.2	6.2	Pt
	4391.3	6.0	Sg	4428.1	5.8	Bh
	4394.2	6.0	Sg	4428.2	6.1	Wf
	4396.1	6.2	Pj	4428.2	6.2	Pt
	4399.2	6.2	Sg	4429.1	5.8	Bh
	4401.2	6.0	Sg	4430.0	6.0	Ya
	4403.2	6.0	Sg	4430.1	6.1	Du
	4404.6	6.1	Ch	4430.1	5.9	Bh
	4406.9	6.0	Kb	4430.8	6.0	Kb
	4408.1	6.3	Cy	4431.1	5.8	Gb
	4409.1	6.3	Cy	4431.2	6.2	Pt
	4409.2	6.2	Sg	4432 8	6.0	Kb
	4410.1	6.1	Bh	4433.8	6.0	Kb
	4413.1	6.0	Bh	4434.2	6.2	Pt
	4413.9	6.3	Cy	4434.8	6.0	Kb
	4414.1	6.5	Gb	4435.1	6.0	Gb
	4414.2	6.2	Bh	4435.1	5.9	Cy
	4415.1	6.0	Bh	4436.8	6.0	Kb
	4415.1	6.2	Gb	4437.1	6.0	Wf
	4415.2	6.1	Pt	4438.1	6.1	Du
	4416.1	6.1	Bh	4438.2	6.0	Wf
	4416.1	6.4	Pj	4439.1	6.0	Gb
	4416.2	6.1	Pt	4439.2	6.2	Pt
	4416.2	6.2	Wf	4440.8	6.0	Kb
	4417.1	6.0	Bh	4441.2	6.2	Pt
	4417.2	6.2	Wf	4444.2	6.2	Pt
	4418.2	6.0	Gb			
154536 X CORONAE BOREALIS—						
	4411.0	9.3	B	4432.0	9.8	B
	4415.2	8.7	Pt	4435.1	9.6	Cy
	4415.3	9.4	Wf	4436.3	10.3	Wf
	4428.2	9.9	Wf			
154615 R SERPENTIS—						
	4382.2	[12.2	Sg	4411.1	13.1	B
	4402.2	13.0	Sg	4434.0	12.5	Cy
154639 V CORONAE BOREALIS—						
	4411.0	7.1	B	4432.0	7.0	B
	4415.2	6.9	Pt	4435.1	7.7	Cy

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
154639 V Cor. Bor.—Continued.						
	4415.3	7.3	Wf	4436.3	7.6	Wf
	4428.2	7.5	Wf	4438.1	7.2	Ya
155229 Z Coronae Borealis—						
	4416.1	12.0	B	4435.1	10.3	Cy
	4434.0	10.2	B			
155823 RZ Scorpii—						
	4369.8	[12.0	Ht	4381.7	10.1	Ht
	4375.8	11.7	Ht	4382.8	9.7	Sm
	4375.8	10.6	Sm	4387.8	9.3	Ht
160021 Z Scorpii—						
	4370.5	10.2	Bl	4385.4	9.4	Bl
	4378.8	9.9	Sm	4385.8	9.7	Sm
160118 R Herculis—						
	4381.2	12.0	Sg	4415.2	9.0	Pt
	4402.2	11.0	Sg	4415.6	9.6	Ch
	4404.6	10.0	Ch	4430.0	8.4	B
	4412.0	9.3	B	4440.0	8.5	B
160210 U Serpentis—						
	4369.2	[11.4	Pj	4415.2	11.4	B
	4387.2	[12.0	Sg	4430.0	10.4	B
	4402.2	11.8	Sg	4435.1	9.7	Cy
	4411.1	11.1	B			
160221a X Scorpii—						
	4375.4	[13.0	Bl			
160325 SX Herculis—						
	4408.3	9.1	Wf	4428.2	8.6	Wf
	4415.2	9.3	Pt	4431.2	8.4	Pt
	4415.3	9.2	Wf	4434.2	8.2	Pt
	4416.2	9.3	Pt	4436.1	7.8	Wf
	4417.2	9.1	Wf	4438.2	8.0	Wf
	4421.2	9.3	Pt	4439.2	8.0	Pt
	4422.2	9.2	Pt	4441.2	8.0	Pt
	4426.2	9.0	Pt	4444.2	7.9	Pt
160519 W Scorpii—						
	4370.5	11.9	Bl	4385.4	12.7	Bl
160625 RU Herculis—						
	4415.2	12.0	Pt	4435.1	11.0	Cy
	4432.1	10.4	B			
161122a R Scorpii—						
	4370.5	11.4	Bl	4385.5	12.6	Bl
	4378.8	[11.5	Sm	4385.8	[12.6	Sm
161122b S Scorpii—						
	4370.5	11.7	Bl	4385.5	10.9	Bl
	4378.8	11.0	Sm	4385.8	10.7	Sm
161138 W Coronae Borealis—						
	4412.5	9.6	Kk	4428.2	9.7	Wf
	4415.2	9.2	Pt	4434.0	9.8	B
	4415.3	9.2	Wf	4436.3	9.9	Wf
	4417.0	9.4	Y	4438.1	9.8	Ya
	4417.2	9.2	Wf	4438.2	9.9	Wf
	4420.0	9.4	B			
161607 W Ophiuchi—						
	4404.6	[11.4	Ch	4415.2	11.6	Pt
162112 V Ophiuchi—						
	4415.2	8.4	Pt			
162119 U Herculis—						
	4369.3	9.2	Pj	4417.2	10.7	Wf
	4370.2	9.2	Pj	4428.2	10.7	Wf
	4381.2	9.1	Sg	4430.1	10.8	B
	4399.2	10.2	Sg	4436.0	11.1	B
162119 U Herculis—Continued.						
	4411.1	10.1	B	4437.1	11.1	Wf
	4415.2	10.7	Pt	4440.0	10.9	B
	4415.3	10.5	Wf			
162807 SS Herculis—						
	4415.2	10.1	Pt			
162815 T Ophiuchi—						
	4375.5	13.1	Bl			
162816 S Ophiuchi—						
	4375.5	[13.3	Bl			
163137 W Herculis—						
	4415.1	12.5	B	4417.1	12.6	Y
	4415.2	12.5	Pt	4432.1	13.0	B
163172 R Ursae Minoris—						
	4408.9	10.7	Lp	4432.9	10.3	Lp
	4420.1	10.3	B			
163266 R Draconis—						
	4404.7	8.8	Ch	4418.2	8.8	Jo
	4411.1	8.8	B	4430.1	9.7	B
	4415.2	8.9	Pt	4432.9	9.8	Lp
	4415.6	9.0	Ch	4438.1	10.0	Ya
	4415.9	8.9	Lp	4438.1	9.0	Jo
	4416.1	8.7	Jo	4440.1	10.5	B
164319 RR Ophiuchi—						
	4382.8	11.2	Sm	4415.2	10.7	Pt
164715 S Herculis—						
	4402.5	10.3	Ik	4415.7	10.5	Ch
	4405.5	10.4	Ik	4417.1	10.0	Y
	4415.1	10.4	B	4432.1	10.6	B
	4415.2	10.5	Pt			
164844 RS Ophiuchi—						
	4369.7	10.7	Ht	4381.8	10.9	Ht
	4370.5	10.2	Bl	4385.8	11.4	Sm
	4375.7	10.9	Ht	4387.8	11.0	Ht
	4378.8	11.4	Sm			
165030 RR Scorpii—						
	4370.5	10.6	Bl			
165202 SS Ophiuchi—						
	4415.2	13.5	Pt			
165631 RV Herculis—						
	4387.2	10.2	Sg	4415.2	9.7	Pt
	4401.2	9.5	Sg	4432.1	10.4	B
	4415.1	9.7	B			
165636 RT Scorpii—						
	4375.2	[14.0	Bl			
170215 R Ophiuchi—						
	4369.2	10.0	Pj	4415.2	12.5	Pt
	4370.2	10.3	Pj	4432.0	12.8	B
170627 RT Herculis—						
	4416.2	14.6	Wf	4436.3	14.9	Wf
	4417.2	14.7	Wf	4438.2	14.8	Wf
	4430.1	14.7	Wf			
170833 RW Scorpii—						
	4370.5	11.9	Bl			
171401 Z Ophiuchi—						
	4412.1	9.1	B	4440.0	8.3	B
	4430.1	8.7	B			
171723 RS Herculis—						
	4415.1	11.7	B	4428.2	10.8	Wf
	4415.2	12.0	Pt	4434.1	10.4	B
	4415.3	11.9	Wf	4436.3	10.0	Wf

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
172486 S Octantis—						
	4375.5	12.4	Bl	4381.8	12.6	Ht
	4375.8	12.5	Ht	4387.8	11.7	Ht
172809 RU Ophiuchi—						
	4412.1	12.1	B	4430.6	10.7	B
	4415.2	11.7	Pt	4440.0	9.6	B
173543 RU Scorpii—						
	4370.5	10.5	Bl			
174135 SV Scorpii—						
	4375.5	[13.0	Bl			
174162 W Pavonis—						
	4369.8	[12.1	Ht	4381.8	[12.3	Ht
	4375.5	[13.0	Bl	4387.8	[12.3	Ht
	4375.7	[12.3	Ht			
174406 RS Ophiuchi—						
	4415.2	11.0	Pt			
174551 U Arae—						
	4370.8	11.9	Sm	4385.9	[12.3	Sm
	4378.7	12.3	Sm			
175111 RT Ophiuchi—						
	4415.1	12.2	B	4434.1	12.5	B
	4415.2	12.2	Pt			
175458a T Draconis—						
	4416.3	13.0	Wf	4438.2	12.7	Wf
	4428.2	12.7	Wf	4440.1	12.6	B
	4436.3	12.6	Wf			
175458b UY Draconis—						
	4416.3	11.3	Wf	4438.2	11.1	Wf
	4428.2	11.1	Wf	4440.1	10.9	B
	4436.3	11.0	Wf			
175519 RY Herculis—						
	4402.7	9.4	Ch	4420.1	9.4	B
	4411.1	9.1	B	4430.1	9.7	B
	4415.2	9.3	Pt	4439.1	10.0	B
175654 V Draconis—						
	4415.2	10.2	Pt			
180363 R Pavonis—						
	4369.8	11.6	Ht	4381.8	12.3	Ht
	4370.8	11.3	Sm	4385.8	12.0	Sm
	4375.7	11.5	Ht	4387.8	12.3	Ht
	4378.7	11.8	Sm			
180531 T Herculis—						
	4381.2	9.0	Sg	4417.3	12.3	Wf
	4402.7	11.0	Ch	4420.1	11.8	B
	4403.2	11.0	Sg	4428.2	12.8	Wf
	4408.9	11.0	Lp	4432.9	12.8	Lp
	4415.2	11.2	Pt	4434.0	12.5	B
	4415.3	11.7	Wf	4436.3	12.9	Wf
	4415.9	11.7	Lp	4438.2	13.0	Wf
180666 X Draconis—						
	4415.2	12.4	Pt	4436.1	[13.4	B
180911 Nova Ophiuchi—						
	4412.1	[13.1	B	4415.2	[13.0	Pt
181103 RY Ophiuchi—						
	4412.1	10.2	B	4430.0	8.9	B
	4415.2	10.2	Pt	4436.2	8.3	Wf
	4415.3	10.8	Wf	4438.2	8.4	Wf
	4417.2	10.3	Wf	4440.0	8.3	B
	4428.2	8.9	Wf			
181136 W Lyrae—						
	4370.2	10.0	Pj	4419.5	8.3	Kk
	4383.6	9.7	Kk	4420.0	8.6	Ya
	4386.2	9.1	Sg	4420.1	8.2	B
	4403.2	8.8	Sg	4420.2	8.0	Jo
	4414.1	8.3	Jo	4428.3	8.5	Wf
	4414.3	8.5	Wf	4436.0	8.2	B
	4415.5	8.3	Kk	4436.3	8.5	Wf
	4415.2	8.1	Pt	4438.1	8.3	Jo
	4416.1	8.8	Jo	4438.2	8.7	Wf
	4417.3	8.6	Wf			
182133 RV Sagittarii—						
	4375.5	[13.6	Bl			
182224 SV Herculis—						
	4415.1	10.3	B	4436.1	11.4	B
	4420.0	10.7	Ya			
183149 SV Draconis—						
	4417.1	[13.0	Y			
183308 X Ophiuchi—						
	4384.2	6.0	Wb	4416.1	7.9	Jo
	4384.2	8.5	Wb	4418.1	8.1	Jo
	4391.2	8.5	Wb	4420.1	8.0	B
	4402.2	8.3	Wb	4434.2	7.8	Wb
	4414.1	8.0	Jo	4438.1	7.7	Ya
	4415.2	7.8	Pt			
184205 R Scuti—						
	4387.2	5.5	Sg	4428.1	6.0	Bh
	4397.3	5.4	Sg	4428.2	6.2	Pt
	4402.7	5.7	Ch	4428.9	5.8	Bh
	4405.9	5.5	Kb	4429.1	6.1	Bh
	4409.1	5.0	Cy	4430.1	5.8	Du
	4410.1	5.5	Bh	4430.1	6.1	Bh
	4412.9	5.3	Cy	4430.8	5.9	Kb
	4413.1	5.9	Bh	4431.1	6.0	Gb
	4414.1	5.8	Gb	4431.2	6.2	Pt
	4414.2	5.6	Bh	4432.8	6.2	Kb
	4415.1	5.5	Bh	4433.8	6.3	Kb
	4415.2	5.8	Pt	4434.2	6.5	Pt
	4416.1	5.6	Bh	4434 8	6.3	Kb
	4416.2	5.4	Pt	4435.1	6.4	Gb
	4415.1	5.6	Bh	4437.2	6.5	Pt
	4419.1	6.1	Hb	4438.1	6.8	Du
	4420.0	5.6	Ya	4438 6	6.9	Mb
	4421.2	5.7	Pt	4439.1	6.6	Gb
	4421.9	5.5	Kb	4439.2	6.8	Pt
	4422.2	5.7	Pt	4440.8	7.0	Kb
	4422.9	5.4	Kb	4441.2	6.9	Pt
	4423.1	5.6	Bh	4444.2	7.2	Pt
	4426.2	6.1	Pt			
184243 RW Lyrae—						
	4415.2	12.6	Pt	4430.9	12.5	B
	4427.1	12.4	B	4439.1	13.2	B
184300 Nova Aquilae No. 3—						
	4387.2	10.7	Sg	4426.2	10.2	Pt
	4403.2	10.6	Sg	4431.2	10.6	Pt
	4411.7	10.3	Ch	4437.2	10.5	Pt
	4415.2	10.6	Pt	4444.2	10.5	Pt
	4420.0	10.4	Ya			
185032 RX Lyrae—						
	4414.7	[11.3	Ch			

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
185243 R LYRAE—						
	4413.1	4.3	Bh	4423.1	4.1	Bh
	4414.2	4.2	Bh	4428.1	4.3	Bh
	4415.1	4.2	Bh	4429.1	4.3	Bh
	4416.1	4.2	Bh	4430.1	4.3	Bh
	4417.1	4.2	Bh			
185137a S CORONAE BOREALIS—						
	4370.5	11.9	Bl	4371.4	11.6	Bl
185512a ST SAGITTARII—						
	4415.7	[11.2	Ch			
185537a R CORONAE AUSTRALIS—						
	4370.5	12.1	Bl	4371.4	11.6	Bl
185634 Z LYRAE—						
	4412.1	13.0	B	4432.1	11.2	B
	4430.1	11.7	B			
185737 RT LYRAE—						
	4414.7	[11.1	Ch			
190108 R AQUILAE—						
	4408.9	9.7	Lp	4420.1	9.0	B
	4415.2	8.8	Pt	4427.8	9.5	Lp
	4415.7	9.6	Ch	4432.0	9.4	Ya
	4415.9	9.5	Lp	4432.9	9.4	Lp
190529a V LYRAE—						
	4415.2	12.5	Pt			
190818 RX SAGITTARII—						
	4406.6	11.5	Ch	4416.1	10.5	B
	4415.2	10.8	Pt	4432.1	10.4	B
	4415.7	10.2	Ch			
190819a RW LYRAE—						
	4406.6	9.2	Ch	4416.1	9.8	B
	4415.2	9.7	Pt	4432.1	10.5	B
	4415.7	9.7	Ch			
190907 TY AQUILAE—						
	4415.2	11.0	Pt			
190925 S LYRAE—						
	4411.2	[13.8	Bi	4433.1	[14.0	B
	4415.7	[11.1	Ch			
190926 X LYRAE—						
	4415.2	9.0	Pt			
190933a RS LYRAE—						
	4414.7	[11.8	Ch			
190967a Y DRACONIS—						
	4404.9	11.6	Ch	4415.2	12.0	Pt
191007 W AQUILAE—						
	4411.7	8.0	Ch	4415.2	8.3	Pt
191017 T LYRAE—						
	4415.2	8.7	Pt	4430.1	9.4	Ya
	4415.7	8.6	Ch			
191019 R SAGITTARII—						
	4381.2	10.1	Sg	4415.2	11.6	Pt
	4404.2	11.0	Sg	4436.1	11.9	B
191033 RY SAGITTARII—						
	4370.6	6.8	Bl	4421.2	6.1	Pt
	4370.7	7.2	Sm	4422.2	6.5	Pt
	4375.5	7.1	Bl	4423.1	7.0	Bh
	4375.8	7.2	Sm	4426.2	6.7	Pt
	4382.7	7.1	Sm	4428.1	7.1	Bh
	4406.6	7.0	Ch	4429.1	7.2	Bh
	4413.1	7.5	Bh	4430.1	7.0	Bh
	4414.2	7.2	Bh	4431.2	6.6	Pt
	4415.1	7.4	Bh	4434.2	6.6	Pt

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
191033 RY SAGITTARII—Continued.						
	4416.1	7.4	Bh	4439.2	6.5	Pt
	4416.2	6.8	Pt	4441.2	6.5	Pt
	4417.1	7.1	Bh	4444.2	6.6	Pt
191123 TY SAGITTARII—						
	4375.5	[13.0	Bl			
191319 S SAGITTARII—						
	4375.5	12.9	Bl	4404.2	[11.1	Sg
	4381.2	[11.1	Sg			
191331 SW SAGITTARII—						
	4375.5	[12.9	Bl			
191350 TZ CYGNI—						
	4415.2	11.0	Pt			
191637 U LYRAE—						
	4415.2	9.5	Pt			
192928 TY CYGNI—						
	4413.7	9.8	Ch	4415.2	9.9	Pt
193311 RT AQUILAE—						
	4412.1	13.5	B	4415.2	13.8	Pt
	4414.7	[11.0	Ch	4437.2	13.7	B
193449 R CYGNI—						
	4369.2	10.9	Pj	4428.3	7.4	Wf
	4370.2	10.5	Pj	4428.9	7.2	Kb
	4386.3	10.3	Wb	4430.0	8.0	Ya
	4392.2	10.0	Wb	4430.8	7.3	Kb
	4396.1	9.8	Pj	4432.8	7.1	Kb
	4402.2	9.7	Wb	4433.8	7.3	Kb
	4411.2	8.7	Bi	4434.2	7.8	Wb
	4411.8	9.1	Ch	4434.8	7.0	Kb
	4413.1	9.2	Cy	4435.1	7.0	Cy
	4414.1	8.0	Jo	4436.1	7.5	B
	4414.3	8.9	Wf	4436.3	6.9	Wf
	4416.1	7.8	Pj	4436.8	6.8	Kb
	4416.2	8.0	Jo	4438.2	6.9	Wf
	4416.2	7.8	Pt	4438.2	7.7	Jo
	4417.3	9.0	Wf	4438.7	6.8	Wb
	4418.2	7.8	Jo	4439.2	7.0	Gb
	4419.9	8.0	Kb	4440.9	7.0	Kb
	4420.2	7.7	Jo	4442.2	7.2	Wb
	4422.9	7.5	Kb	4443.1	7.0	Al
193509 RV AQUILAE—						
	4416.2	[12.5	Pt			
193972 T PAVONIS—						
	4369.8	12.5	Ht	4375.7	12.7	Ht
	4375.5	12.8	Bl	4381.8	12.9	Ht
194048 RT CYGNI—						
	4406.9	8.0	Kb	4427.2	6.8	B
	4411.9	7.7	Ch	4430.8	7.5	Kb
	4412.2	7.4	Bi	4432.2	7.2	Jo
	4413.1	8.0	Cy	4432.8	7.4	Kb
	4414.1	7.4	Jo	4433.8	7.3	Kb
	4416.2	7.6	Jo	4434.8	7.3	Kb
	4416.2	7.4	Pt	4435.1	6.7	Cy
	4418.2	7.5	Jo	4436.1	7.6	B
	4420.2	7.4	Jo	4438.1	7.0	Jo
	4421.9	7.5	Kb	4439.2	8.0	Gb
	4422.9	7.5	Kb	4440.9	7.3	Kb
194348 TU CYGNI—						
	4412.2	12.2	Bi	4436.1	13.2	B
	4416.2	12.6	Pt			

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
194604 X AQUILAE—						
	4369.2	[11.6	Pj	4416.1	[11.6	Pj
	4370.2	[12.3	Pj	4430.1	14.3	Wf
	4396.2	[9.7	Pj	4433.1	14.0	B
	4414.3	14.5	Wf	4436.2	14.2	Wf
194632 χ CYGNI—						
	4369.2	[12.4	Pj	4416.2	13.0	Pt
	4370.2	[11.5	Pj	4417.3	11.6	Wf
	4396.2	[10.5	Pj	4432.9	11.0	Lp
	4408.9	10.5	Lp	4427.1	10.5	B
	4411.8	[11.6	Ch	4428.3	10.8	Wf
	4414.3	12.0	Wf	4436.2	9.7	Wf
	4415.9	10.5	Lp	4438.2	9.8	Wf
	4416.1	[11.0	Pj			
194929 RR SAGITTARII—						
	4370.6	10.8	Bl			
195142 RU SAGITTARII—						
	4369.8	7.0	Ht	4375.8	7.0	Sm
	4370.6	7.0	Bl	4381 8	7.0	Ht
	4370.7	7.2	Sm	4382.7	6.1	Sm
	4375.7	6.8	Ht	4387.8	7.0	Ht
195202 RR AQUILAE—						
	4416.2	10.4	Pt	4429.1	9.9	B
195308 RS AQUILAE—						
	4433.1	12.5	B			
195553 NOVA CYGNI—						
	4415.2	12.5	Pt	4433.2	12.6	Pt
	4418.2	12.6	Pt	4442.2	12.6	Pt
	4431.2	12.6	Pt			
195849 Z CYGNI—						
	4414.3	13.8	Wf	4436.3	13.4	Wf
	4428.3	13.5	Wf			
195855 S TELESCOPII—						
	4375.5	12.8	Bl			
200212 SY AQUILAE—						
	4414.2	13.5	Br	4433.1	13.9	B
	4416.2	12.5	Pt			
200357 S CYGNI—						
	4401.2	10.4	Sg	4417.3	9.9	Wf
	4412.1	10.1	Bi	4428.3	9.9	Wf
	4413.7	9.6	Ch	4429.1	9.3	B
	4414.3	9.8	Wf	4436.3	10.0	Wf
	4416.2	9.6	Pt			
200514 R CAPRICORNI—						
	4411.1	12.4	B	4439.1	12.1	B
200715a S AQUILAE—						
	4408.9	10.6	Lp	4428.3	11.6	Wf
	4414.3	11.6	Wf	4429.1	11.1	B
	4415.7	11.0	Ch	4432.9	11.7	Lp
	4415.9	11.1	Lp	4436.3	11.4	Pt
	4416.2	11.0	Pt	4438.2	11.3	Wf
	4417.3	11.7	Wf			
200715b RW AQUILAE—						
	4416.2	9.0	Pt	4430.1	9.0	Ya
	4429.1	9.2	B			
200747 R TELESCOPII—						
	4375.5	14.0	Bl			
200812 RU AQUILAE—						
	4411.2	13.6	Bi	4437.1	13.8	B
	4412.2	13.7	B			

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
200822 W CAPRICORNI—						
	4375.5	[12.8	Bl			
200906 Z AQUILAE—						
	4414.2	13.4	B	4434.1	11.7	B
	4416.2	13.3	Pt			
200916 R SAGITTAE—						
	4430.1	9.1	Ya			
200938 RS CYGNI—						
	4391.3	7.2	Sg	4428.1	8.7	Bh
	4402.7	7.8	Ch	4430.9	8.8	Kb
	4406.9	8.8	Kb	4432.8	8.8	Kb
	4409.2	7.2	Sg	4433.8	8.8	Kb
	4411.8	7.8	Ch	4434.8	8.7	Kb
	4413.1	8.7	Cy	4435.1	8.2	Cy
	4415.5	8.7	Du	4436.9	8.9	Kb
	4416.2	7.7	Pt	4439.2	8.4	Gb
	4417.1	8.6	Bh	4440.8	8.9	Kb
	4419.2	8.1	Gb	4443.1	8.3	Al
	4420.0	9.0	Kb	4443.7	8.9	Mb
	4422.9	8.8	Kb			
201008 R DELPHINI—						
	4415.7	10.2	Ch	4427.1	10.6	B
	4416.2	9.1	Pt	4432.1	11.2	Ya
201121 RT CAPRICORNI—						
	4416.2	6.3	Pt			
201130 SX CYGNI—						
	4411.2	10.0	Br	4435.1	11.6	Cy
	4416.2	10.2	Pt	4440.1	10.9	B
	4430.2	10.2	B			
201139 RT SAGITTARII—						
	4370.6	7.7	Bl			
201437b WX CYGNI—						
	4391.3	10.6	Sg	4416.2	9.6	Pt
	4402.7	10.7	Ch	4419.2	9.0	Gb
	4409.2	10.3	Sg	4429.1	10.0	B
	4412.2	10.0	Bi	4435.1	10.6	Cy
	4413.1	10.4	Cy	4439.2	10.4	Gb
201647 V CYGNI—						
	4369.2	9.8	Pj	4416.2	8.0	Pt
	4370.2	10.3	Pj	4419.2	8.0	Gb
	4396.2	8.8	Pj	4430.2	7.9	B
	4409.2	7.8	Sg	4433.2	5.8	Br
	4412.1	7.7	Bi	4439.2	8.0	Gb
	4416.1	8.9	Pj	4440.1	7.8	B
202240 U MICROSCOPII—						
	4375.6	[13.6	Bl			
202817 Z DELPHINI—						
	4411.2	9.8	Br	4427.1	10.5	B
	4412.1	9.8	Bi	4429.1	10.2	Bi
	4416.2	10.2	Pt	4432.1	11.0	Ya
202946 SZ CYGNI—						
	4415.2	9.3	Pt	4434.2	9.0	Pt
	4416.2	9.3	Pt	4437.2	9.0	Pt
	4418.2	8.9	Pt	4439.2	9.6	Pt
	4421.2	8.9	Pt	**4441.2**	**9.6**	**Pt**
	4422.2	9.1	Pt	4441.2	9.8	Pt
	4426.2	9.5	Pt	4443.4	9.9	Pt
	4431.2	9.4	Pt	4444.2	9.9	Pt
	4433.2	8.8	Pt			

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
202954 ST CYGNI—						
	4412.2	10.3	Bi	4429.1	10.7	B
	4416.2	10.7	Pt			
203226 V VULPECULAE—						
	4416.2	8.8	Pt			
203429 R MICROSCOPII—						
	4375.5	[12.8	Bl			
203611 Y DELPHINI—						
	4411.2	9.1	Br	4416.2	8.8	B
203816 S DELPHINI—						
	4416.2	10.0	Pt	4429.1	9.6	B
203847 V CYGNI—						
	4411.8	11.2	Ch	4417.3	11.7	Wf
	4412.2	10.3	Bi	4428.3	11.3	Wf
	4414.2	11.7	Br	4429.2	10.0	B
	4414.3	11.3	Wf	4436.3	11.0	Wf
	4416.2	11.2	Pt	4438.3	11.1	Wf
203905 Y AQUARII—						
	4386.3	10.1	Sg	4430.1	9.2	B
	4402.7	9.6	Ch	4432.1	9.2	Ya
	4413.1	9.0	B	4439.1	9.5	B
	4416.2	8.9	Pt			
204016 T DELPHINI—						
	4387.3	10.2	Sg	4427.1	11.4	B
	4411.2	11.2	Br	4428.3	11.8	Wf
	4414.3	11.2	Wf	4432.1	12.0	Ya
	4415.7	11.6	Ch	4435.2	12.4	Cy
	4416.2	11.4	Pt	4436.3	12.1	Wf
204102 V AQUILAE—						
	4416.2	8.1	Pt	4432.0	8.6	Ya
204104 W AQUARII—						
	4414.1	13.6	B	4439.1	13.3	B
	4430.1	13.7	B			
204215 U CAPRICORNI—						
	4375.5	13.4	Bl	4430.1	[13.6	B
	4412.2	[13.9	B	4439.1	14.0	B
204318 V DELPHINI—						
	4387.3	[12.5	Sg	4414.2	[14.0	Br
	4402.3	[12.6	Sg	4415.2	[12.6	B
204405 T AQUARII—						
	4370.2	8.4	Pj	4419.1	7.5	Hb
	4386.3	7.8	Sg	4427.0	8.4	B
	4402.7	7.4	Ch	4432.0	9.0	Ya
	4416.2	7.7	Pt			
204846 RZ CYGNI—						
	4409.2	[11.9	Sg	4416.2	12.8	Pt
	4412.2	11.9	Bi	4428.3	13.7	Wf
	4414.2	13.2	Br	4429.2	12.6	B
	4414.3	13.4	Wf	4436.3	13.6	Wf
204954 S INDI—						
	4375.5	[13.5	Bl			
205017 X DELPHINI—						
	4412.1	8.8	Bi	4429.1	9.6	Bi
	4416.2	9.0	Pt	4432.1	9.8	Ya
	4427.1	9.5	B			
205923a R VULPECULAE—						
	4403.2	8.3	Sg	4426.3	8.5	Wf
	4408.3	8.0	Wf	4427.2	8.5	Wf
	4409.2	8.1	Wf	4428.3	8.5	Wf
	4412.2	7.8	Bi	4429.1	8.3	Bi
	4414.3	7.7	Wf	4430.2	8.9	B
205923a R VULPECULAE—Continued.						
	4415.3	7.7	Wf	4430.4	8.6	Wf
	4415.7	8.3	Ch	4432.1	8.7	Wf
	4416.3	7.8	Wf	4436.3	8.8	Wf
	4416.7	8.0	Pt	4437.2	8.8	Wf
	4417.3	7.8	Wf	4438.2	8.7	Wf
	4418.4	8.0	Wf	4439.2	9.2	B
210124 V CAPRICORNI—						
	4370.6	9.7	Bl	4421.7	10.8	Mb
210221 X CAPRICORNI—						
	4370.6	11.2	Bl			
210382 X CEPHEI—						
	4433.1	[13.8	B			
210504 RS AQUARII—						
	4416.2	13.5	Pt	4436.1	13.2	B
210516 Z CAPRICORNI—						
	4416.2	10.8	Pt	4427.1	10.8	B
210812 R EQUULEI—						
	4414.3	10.2	Wf	4428.3	9.3	Wf
	4416.2	10.1	Pt	4436.3	9.2	Wf
210868 T CEPHEI—						
	4381.2	6.9	Sg	4414.7	7.0	Ch
	4383.5	6.5	Kk	4415.5	7.5	Kk
	4385.2	6.0	Wb	4416.1	7.8	Bh
	4387.7	6.5	Kk	4416.2	6.8	Pt
	4391.3	6.8	Sg	4419.1	6.7	Hb
	4401.5	7.0	Kk	4419.4	7.4	Kk
	4402.5	6.9	Ik	4419.5	7.5	Ik
	4402.7	7.0	Ch	4420.5	7.5	Ik
	4405.6	7.1	Kk	4428.9	7.8	Kb
	4406.5	7.1	Kk	4430.2	8.1	Du
	4406.9	7.0	Kb	4430.9	8.0	Kb
	4407.5	7.1	Ik	4432.8	8.1	Kb
	4408.5	7.4	Ik	4434.8	7.9	Kb
	4409.5	7.4	Kk	4435.2	7.8	Cy
	4412.5	7.5	Ik	4436.9	8.2	Kb
	4414.5	7.4	Kk	4438.2	8.3	Du
	4414.6	7.5	Ik	4440.8	8.3	Kb
210903 RK AQUARII—						
	4416.2	9.5	B	4432.0	9.6	Ya
	4416.2	9.4	Pt			
211614 X PEGASI—						
	4408.9	11.1	Lp	4428.3	12.4	Wf
	4414.3	11.6	Wf	4432.9	11.9	Lp
	4415.8	11.5	Lp	4436.2	12.2	B
	4416.2	11.3	Pt	4436.3	12.4	Wf
	4417.3	11.9	Wf	4438.2	12.4	Wf
211615 T CAPRICORNI—						
	4375.5	12.1	Bl	4429.1	9.4	B
	4415.7	9.3	Ch	4432.1	9.5	Ya
212030 S MICROSCOPII—						
	4370.6	11.0	Bl			
212814 Y CAPRICORNI—						
	4375.5	[12.9	Bl	4431.1	[13.7	B
	4415.7	[10.6	Ch	4440.1	[13.5	B
213678 S CEPHEI—						
	4412.2	8.0	Bi	4429.1	8.0	Bi
	4416.2	8.2	Pt	4435.2	8.9	Cy
213753 RU CYGNI—						
	4413.8	8.9	Ch	4435.2	9.0	Cy
	4416.2	8.5	Pt			

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
213843 SS CYGNI—						
	4381.2	11.8	Sg	4417.3	12.1	Wf
	4382.2	11.5	Sg	4418.2	11.8	Pt
	4386.2	10.8	Sg	4418.2	12.0	Br
	4387.2	8.5	Sg	4418.4	11.9	Wf
	4391.3	8.5	Sg	4420.0	11.9	B
	4389.6	9.0	Ch	4421.2	11.8	Pt
	4390.6	8.7	Ch	4422.2	11.8	Pt
	4391.3	8.5	Sg	4425.1	12.1	Du
	4391.6	8.3	Ch	4426.2	11.8	Pt
	4392.6	8.3	Ch	4426.3	12.0	Wf
	4394.2	8.5	Sg	4427.2	12.0	Wf
	4401.2	8.8	Sg	4428.3	12.1	Wf
	4402.6	8.8	Ch	4429.1	11.9	Bi
	4403.2	9.5	Sg	4430.1	12.0	B
	4403.7	9.0	Ch	4430.1	12.0	Du
	4406.6	10.6	Ch	4430.4	11.9	Wf
	4408.2	11.5	Br	4431.2	11.8	Pt
	4408.3	11.5	Wf	4432.1	12.0	Wf
	4409.2	11.7	Wf	4432.2	12.0	Du
	4409.2	11.8	Sg	4433.2	11.7	Pt
	4411.0	11.9	B	4434.2	11.8	Pt
	4411.2	11.7	Br	4434.3	12.0	Du
	4411.4	12.0	Cy	4435.1	12.0	Cy
	4411.8	11.8	Ch	4436.3	12.0	Wf
	4412.0	11.8	B	4437.2	11.8	Pt
	4412.1	11.9	Cy	4437.2	12.1	Wf
	4412.2	11.7	Bi	4438.1	11.8	Du
	4413.3	11.7	Ch	4438.2	12.1	Wf
	4414.2	12.0	Br	4439.1	11.9	B
	4414.3	11.8	Wf	4439.2	11.8	Pf
	4415.0	11.9	B	4440.1	11.9	Du
	4415.2	11.9	Pt	4441.2	11.8	Pt
	4415.2	12.0	Br	4442.0	11.8	Du
	4415.3	12.0	Wf	4442.3	11.5	Pt
	4416.2	11.9	Pt	4443.2	11.6	Pt
	4416.2	11.9	Br	4444.2	11.8	Pt
	4416.3	12.0	Wf			
	4417.2	11.9	Br			
213937 RV CYGNI—						
	4416.2	6.6	Pt			
214024 RR PEGASI—						
	4415.1	9.9	B	4428.3	9.4	Wf
	4415.3	10.2	Wf	4436.3	9.7	Wf
	4416.2	9.9	Pt			
214247 R GRUIS—						
	4369.8	8.2	Ht	4381.8	8.6	Ht
	4370.6	8.3	Bl	4382.7	8.4	Sm
	4370.8	8.2	Sm	4387.8	8.6	Ht
	4375.5	8.3	Bl	4394.7	8.6	Ht
	4375.8	8.3	Ht	4414.2	9.0	Bh
	4375.8	8.2	Sm			
215605 V PEGASI—						
	4412.2	14.0	Bi	4437.2	14.0	B
215717 U AQUARII—						
	4416.2	12.3	Pt	4436.1	12.3	B
215934 RT PEGASI—						
	4412.2	14.0	Bi	4429.1	[13.5	Bi
220133a RY PEGASI—						
	4416.2	12.4	Pt			
220133b RZ PEGASI—						
	4416.2	11.8	Pt			
220613 Y PEGASI—						
	4412.2	11.9	Bi	4429.1	11.3	Bi
	4415.1	11.0	B	4439.0	12.4	B
	4416.2	11.5	Pt			
220714 RS PEGASI—						
	4412.2	12.4	Bi	4429.1	12.3	Bi
	4415.1	12.8	B	4439.0	12.7	B
	4416.2	11.5	Pt			
221938 T GRUIS—						
	4370.8	10.7	Sm	4382.7	11.6	Sm
	4375.8	11.3	Sm			
221948 S GRUIS—						
	4370.8	[12.8	Sm	4381.8	[12.8	Ht
	4371.8	[12.2	Ht	4382.8	[12.8	Sm
	4375.9	[12.8	Ht	4387.8	[12.8	Ht
222129 RV PEGASI—						
	4414.3	12.5	Br	4416.0	12.0	B
222439 S LACERTAE—						
	4412.2	8.7	Bi	4416.2	8.8	Pt
	4414.3	8.6	Br	4429.2	9.6	Bi
222867 R INDI—						
	4375.5	13.8	Bl			
223462 T TUCANAE—						
	4369.8	10.2	Ht	4381.8	9.1	Ht
	4370.7	10.2	Sm	4382.8	9.6	Sm
	4375.7	9.3	Ht	4387.8	9.0	Ht
	4375.8	9.9	Sm			
223841 R LACERTAE—						
	4412.2	9.9	Bi	4416.2	9.6	Pt
	4414.3	9.8	Br	4429.2	9.6	Bi
225914 RW PEGASI—						
	4404.2	11.5	Sg	4416.2	11.7	Pt
	4416.1	10.6	B	4439.0	10.6	B
230110 R PEGASI—						
	4386.3	10.7	Sg	4419.2	11.0	Gb
	4414.3	11.3	Wf	4428.3	11.9	Wf
	4416.2	11.7	Pt	4436.3	12.0	Wf
	4417.3	11.5	Wf	4438.2	12.2	Wf
230759 V CASSIOPEIAE—						
	4383.5	11.2	Kk	4433.0	7.8	B
	4387.3	11.0	Sg	4435.2	7.8	Cy
	4416.1	9.2	B	4438.1	7.7	Ya
	4416.2	8.9	Pt	4438.2	8.0	Du
	4430.1	8.0	Du			
231425 W PEGASI—						
	4412.2	9.1	Bi			
231508 S PEGASI—						
	4416.1	10.5	B	4416.2	10.8	Pt
232746 V PHOENICIS—						
	4369.8	9.1	Ht	4381.8	9.5	Ht
	4370.8	9.7	Sm	4382.8	9.7	Sm
	4375.8	9.7	Sm	4387.8	9.7	Ht
	4375.8	9.5	Ht			
232848 Z ANDROMEDAE—						
	4416.2	9.4	Pt			
233335 SZ ANDROMEDAE—						
	4382.2	9.5	Sg	40416.2	8.8	Pt
	4404.2	9.3	Sg	4427.1	9.0	B

VARIABLE STAR OBSERVATIONS RECEIVED DURING OCTOBER, 1925—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
233815 R AQUARII—						
	4402.7	10.0	Ch	4414.5	10.1	Kk
	4412.5	10.2	Kk	4416.2	10.0	Pt
233956 Z CASSIOPEIAE—						
	4408.3	14.3	Wf	4416.3	14.2	Wf
	4412.2	14.0	Bi	4430.1	14.2	Wf
	4414.1	13.8	B	4436.1	14.1	Wf
	4414.3	14.3	Wf			
235053 RR CASSIOPEIAE—						
	4384.5	9.4	Kk	4437.2	13.4	B
	4411.1	13.4	B	4414.3	13.3	Br
235209 V CETI—						
	4375.5	[13.6	Bl			
235265 R TUCANAE—						
	4370.8	12.9	Sm			
235350 R CASSIOPEIAE—						
	4412.2	10.0	Bi	4414.5	11.2	Kk
	4412.5	11.2	Kk	4419.5	11.3	Kk
235855 Y CASSIOPEIAE—						
	4416.1	11.3	B	4433.0	11.6	B
235939 SV ANDROMEDAE—						
	4412.2	13.9	Bi	4416.2	13.1	Pt
	4414.1	13.5	B	4439.0	12.6	B
	4414.3	13.3	Br			

Total observations, 1835; stars observed, 333; total observers 27.

President, J. Ernest G. Yalden; *Vice-President*, Charles C. Godfrey;
Secretary, W. Tyler Olcott; *Treasurer*, Michael J. Jordan.

Council Members

Alice H. Farnsworth, Howard O. Eaton,
Willard J. Fisher, Margaret Harwood.

Past Presidents

David B. Pickering, 1919; Harry C. Bancroft, Jr., 1920;
Leon Campbell, 1921-22; Anne S. Young, 1923-24.

A more complete account of the meeting will appear in a forthcoming issue of Variable Comments.

The following observers have contributed to this report of observations received during the month of October, 1925: Allen, "Al"; Baldwin, "Bl"; Berman, "Bi"; Bouton, "B"; Brocchi, "Br"; Bunch, "Bh"; Chandra, "Ch"; Cilley, "Cy"; Dunham, "Du"; Gaebler, "Gb"; Houghton, "Ht"; Ikeda, "Ik"; Jones, "Jo"; Kasai, "Kk"; Koelbloed, "Kb"; Lepper, "Lp"; Murdock, "Mb"; Peltier, "Pt"; Petrie, "Pj"; Rhorer, "Rh"; Skaggs, "Sg"; Smith, "Sm"; Mrs. Thomas, "To"; Waterfield, "Wf"; White, "Wb"; Yalden, "Ya"; Young, "Y".

SUMMARY OF ANNUAL REPORTS.

Year	Observations	Stars	Observers
1912	6,180	175	19
1913	12,914	200	20
1914	14,506	255	28
1915	14,724	282	29
1916	11,261	290	30
1917	15,788	332	43
1918	16,112	380	34
1919	8,710	352	53
1920	9,099	395	69
1921	15,513	386	77
1922	16,994	372	72
1923	17,745	441	68
1924	19,484	450	70
1925	23,375	439	68
Totals	201,405	450	285*

*Approximate number of observers in all the published reports of the A.A.V.S.O.

ANNUAL SUMMARY FOR 1925.

Desig.	Name. Pages	49	128	198	263	324	396	464	545	608	676	Totals
000339.	V SCL	5	3	2	2	1	3	2	.	2	1	21
001032	S SCL	7	10	27	15	9	5	2	.	5	6	86
001046	X AND	13	4	10	7	1	2	6	12	5	4	64
001620	T CET	13	12	19	14	1	.	.	1	9	.	69
001726	T AND	22	10	9	7	4	2	.	6	9	8	77
001755	T CAS	27	5	8	7	7	3	5	7	10	13	92
001833	R AND	7	3	6	2	2	3	9	28	17	13	90
001862	S TUC	3	5	5	8	7	2	2	2	2	3	39
001909	S CET	19	6	8	2	1	1	.	.	6	3	46
002546	T PHE	3	2	2	5	8	6	2	.	2	1	31
002833	W SCL	3	1	1	1	1	1	1	.	.	1	11
003179	Y CEP	5	2	2	1	1	.	.	1	1	.	13
004047	U CAS	19	6	13	7	2	3	3	10	7	6	76
004132	RW AND	7	4	5	3	3	2	.	.	4	2	30
004435	V AND	4	3	6	4	.	.	.	4	3	3	27
004435	X SCL	2	1	1	3	4	3	2	.	1	1	18
004533	RR AND	7	2	3	2	.	2	3	6	4	5	34
004746a	RV CAS	7	2	9	3	1	3	4	8	5	7	49
004746b	— CAS	5	2	1	1	1	1	1	5	4	4	25
004958	W CAS	7	2	3	3	4	1	11	18	4	6	59
005475	U TUC	5	6	5	8	3	3	1	10	4	1	52
005840	RX AND	5	7	12	16	9	6	.	10	19	14	102
010102	Z CET	3	3	1	2	.	.	.	1	1	8	19
010630	U SCL	2	3	2	4	2	1	1	.	1	1	17
010940	U AND	7	4	3	1	1	3	5	5	5	4	38
011041	UZ AND	9	3	5	2	1	1	3	5	6	5	40
011208	S PSC	6	2	.	2	.	.	.	.	1	1	12
011272	S CAS	12	2	9	4	6	8	16	23	7	11	98
011712	U PSC	6	1	1	1	1	.	.	2	2	2	16
012233a	R SCL	.	.	4	2	.	.	.	.	1	.	7
012350	RZ PER	4	2	1	3	2	1	.	.	1	2	16
012502	R PSC	6	4	5	5	1	1	.	1	4	2	29
013238	RU AND	11	7	6	4	1	3	4	6	6	6	54
013338	Y AND	6	4	3	3	1	2	1	2	4	3	29
014958	X CAS	4	2	2	3	3	1	2	2	1	3	23
015354	U PER	12	2	3	4	4	3	3	2	2	3	38
015912	S ARI	5	1	2	2	2	.	.	.	1	4	17
021024	R ARI	39	23	24	16	3	6	.	12	10	15	148
021143a	W AND	8	4	16	27	6	8	6	11	6	9	101
021258	T PER	2	2	2	1	2	3	4	2	2	2	22
021281	Z CEP	9	5	1	1	1	5	7	10	4	4	47
021403	o CET	46	45	82	34	41	31	7	3	16	14	312
021558	S PER	11	4	5	4	5	9	7	11	10	5	71
022000	R CET	7	3	1	.	1	2	.	.	2	1	17
022150	RR PER	9	2	2	2	3	6	9	7	5	4	49
022426	R FOR	4	4	3	4	4	3	5	.	1	1	29
022813	U CET	11	22	5	1	1	2	.	1	1	2	46
022980	RR CEP	8	4	1	1	1	2	9	6	5	4	41
023133	R TRI	19	18	18	9	9	6	.	6	6	10	101
024356	W PER	24	30	18	7	6	8	2	8	2	5	110
025050	R HOR	4	6	10	7	9	15	6	1	1	2	61
025751	T HOR	3	.	6	7	7	8	5	1	1	2	40
030514	U ARI	5	.	1	2	3	3	.	.	3	2	19
031401	X CET	11	.	3	2	6	3	.	2	6	5	37
032043	Y PER	8	10	11	1	2	3	2	2	2	2	44
032335	R PER	6	5	3	3	5	6	3	8	8	9	56
032443	Nv. PER. #3	3	2	.	2	.	.	.	.	1	.	8
042209	R TAU	3	5	2	.	8	4	1	1	2	2	28
042215	W TAU	17	16	8	6	9	3	1	1	1	2	64
042309	S TAU	2	5	3	.	7	1	1	1	2	1	23
043065	T CAM	5	2	1	1	4	3	3	4	4	1	28

ANNUAL SUMMARY FOR 1925—Continued.

Desig.	Name.	Pages	52	130	200	265	325	397	465	546	608	677	Totals
043208	RX	TAU	2	2	5	4	7	5	.	.	1	1	27
043263	R	RET	3	2	10	8	9	17	9	4	1	1	64
043274	X	CAM	7	6	2	2	4	3	2	2	2	2	32
043562	R	DOR	6	5	9	8	7	16	10	14	2	.	77
043738	R	CAE	3	1	5	2	5	9	10	5	1	.	41
044349	R	PIC	5	2	2	5	4	3	7	6	1	1	36
044617	V	TAU	5	5	4	3	5	9	3	1	8	8	51
045307	R	ORI	2	4	2	2	1	2	.	.	1	.	14
045514	R	LEP	10	9	17	30	30	8	12	.	3	4	123
050003	V	ORI	4	5	5	5	4	2	1	.	1	2	29
050022	T	LEP	3	4	4	6	7	5	6	1	1	1	38
050848	S	PIC	1	2	5	7	8	9	8	8	1	.	49
050953	R	AUR	5	4	7	5	3	15	12	12	8	7	78
051247	T	PIC	3	3	8	3	5	16	10	8	1	.	57
051553	T	COL	1	4	10	8	10	15	9	12	2	.	71
052034	S	AUR	5	4	4	2	7	6	2	2	.	1	33
052036	W	AUR	4	3	2	1	5	2	2	1	3	2	25
052404	S	ORI	4	5	4	4	4	2	1	.	2	2	28
053005a	T	ORI	22	8	24	18	23	21	5	.	3	9	133
053068	S	CAM	3	1	1	1	1	1	2	2	1	1	14
053326	RR	TAU	.	2	3	.	2	2	.	.	.	.	9
053337	RU	AUR	2	2	2	3	4	2	3	.	3	.	21
053531	U	AUR	7	5	5	3	2	2	1	.	2	.	27
053920	Y	TAU	.	.	.	19	15	.	11	.	.	.	45
054319	SU	TAU	21	16	36	24	36	51	18	.	13	21	236
054331	S	COL	2	1	4	2	5	11	12	12	1	.	50
054615a	Z	TAU	2	3	1	2	1	1	.	.	1	.	11
054615b	RU	TAU	.	.	.	.	1	1	.	.	.	.	2
054615c	RS	TAU	2	2	1	2	1	1	.	.	1	.	10
054629	R	COL	2	1	3	4	3	3	6	8	1	.	31
054920a	U	ORI	35	18	31	9	19	11	3	.	3	6	135
054920b	UW	ORI	6	7	11	5	8	14	.	.	1	2	53
054974	V	CAM	9	3	4	3	4	8	9	7	5	7	59
055353	Z	AUR	5	5	5	5	6	13	13	11	14	8	85
055686	R	OCT	3	3	5	7	8	9	7	6	2	2	52
060450	X	AUR	7	3	4	2	5	20	11	5	1	.	59
060547	SS	AUR	.	46	75	28	42	62	57	24	25	31	390
061647	V	AUR	.	2	1	1	1	2	.	.	.	.	7
061702	V	MON	3	1	2	2	12	5	13	.	1	.	39
061907	T	MON	.	.	.	.	.	3	.	.	.	.	3
062808	Z	MON	.	.	.	.	7	.	2	.	.	.	9
063159	U	LYN	1	1	1	1	1	1	.	.	.	.	6
063308	R	MON	2	1	2	2	2	3	1	.	1	.	14
063462	Nov.	PIC	.	.	.	.	.	.	.	27	25	61	113
063558	S	LYN	4	3	3	3	4	4	1	.	2	.	24
064030	X	GEM	2	2	3	2	1	1	.	.	.	1	12
064707	W	MON	2	1	2	3	2	2	1	.	.	.	13
065111	Y	MON	5	2	5	4	5	11	2	1	.	.	35
065208	X	MON	2	1	3	5	15	4	24	.	.	.	54
065355	R	LYN	4	3	1	1	1	6	9	5	5	5	40
070109	V	CMI	2	.	4	1	1	2	.	1	.	.	11
070122a	R	GEM	10	7	15	30	13	23	11	.	3	5	117
070122b	Z	GEM	2	2	3	6	3	7	3	.	1	.	27
070122c	TW	GEM	5	1	1	.	4	8	5	.	1	.	25
070310	R	CMI	3	.	1	5	3	9	1	.	.	.	22
070772	R	VOL	.	3	7	4	4	13	2	7	2	2	44
071044	L2	PUP	.	.	.	.	.	.	.	.	.	1	1
071201	RR	MON	1	.	2	4	5	.	.	1	.	.	13
071713	V	GEM	3	1	4	12	2	3	2	.	1	.	28
072708	S	CMI	5	5	12	5	14	27	22	3	1	1	90
072811	T	CMI	3	1	3	1	1	.	.	.	1	.	10

ANNUAL SUMMARY FOR 1925—Continued.

Desig.	Name. Pages	53	131	202	267	327	400	467	547	609	678	Totals
072820b	Z PUP	1	.	.	1	.	1	.	.	.	.	3
073173	S VOL	3	2	2	4	4	3	6	3	1	1	29
073508	U CMI	5	1	2	4	7	4	3	.	.	.	27
073723	S GEM	2	1	3	3	2	6	3	3	.	1	24
074241	W PUP	4	3	7	8	9	16	10	19	2	.	78
074323	T GEM	1	.	4	3	1	6	3	3	.	1	22
074922	U GEM	32	40	76	29	48	56	57	12	2	11	363
075612	U PUP	1	1	1	1	4	5	1	1	.	.	17
081112	R CNC	5	2	4	8	16	24	43	5	1	.	108
081617	V CNC	2	3	4	3	7	10	3	1	1	.	34
082405	RT HYA	1	1	1	3	1	1	2	.	.	.	10
082476	R CHA	7	3	1	1	3	4	6	13	5	5	48
083019	U CNC	1	1	3	2	7	13	8	.	.	2	37
083350	X UMA	2	1	.	1	1	6	6	1	.	.	18
083409	RV HYA	.	.	.	1	.	9	3	.	.	.	13
084803	S HYA	2	1	3	3	7	8	3	2	1	.	30
085008	T HYA	4	2	2	4	4	5	4	2	.	.	27
085120	T CNC	3	4	2	3	6	7	6	2	1	.	34
090024	S PYX	1	1	.	1	1	2	.	.	.	.	6
090151	V UMA	.	1	5	1	2	1	1	.	1	.	12
090425	W CNC	2	1	1	2	3	7	10	.	.	2	28
091868	RW CAR	7	1	1	1	1	3	6	6	1	1	27
092551	Y VEL	6	1	2	1	4	3	6	9	2	4	38
092962	R CAR	7	2	4	8	9	17	10	19	8	6	88
093014	X HYA	2	2	2	3	5	8	3	1	.	.	26
093178	Y DRA	2	3	3	1	3	6	20	11	.	1	50
093934	R LMI	2	2	3	3	8	17	8	11	.	.	54
094023	RR HYA	.	.	.	.	.	.	.	.	1	.	1
094211	R LEO	5	6	10	15	17	45	94	.	9	.	201
094622	Y HYA	1	1	1	1	1	1	1	.	.	.	7
094953	Z VEL	3	2	4	9	10	17	10	11	3	4	73
095421	V LEO	5	3	4	4	8	16	11	5	1	1	58
095563	RV CAR	3	1	1	1	1	3	6	3	1	1	21
095814	RY LEO	.	.	.	1	3	11	11	2	.	.	28
100661	S CAR	7	2	6	1	10	16	10	19	8	9	88
100860	U UMA	.	.	.	.	.	.	2	.	1	.	3
101058	Z CAR	3	2	2	2	3	3	3	3	.	2	23
101153	W VEL	5	1	2	4	8	7	3	2	2	1	35
103212	U HYA	1	5	13	11	10	5	13	2	.	.	60
103769	R UMA	9	10	19	33	24	40	26	24	8	9	202
104620	V HYA	7	3	3	6	8	10	10	7	1	1	56
104628	RS HYA	6	1	.	2	1	1	5	6	1	2	25
104814	W LEO	.	1	1	2	7	12	10	2	2	.	37
110361	RS CAR	.	.	.	2	2	2	1	4	.	1	12
110506	S LEO	1	2	1	.	4	8	9	1	.	.	26
111561	RY CAR	1	1	1	2	1	1	2	2	1	1	13
111661	RS CEN	5	2	2	3	9	9	8	6	7	6	57
114441	X CEN	6	1	.	4	2	1	5	5	2	2	28
115058	W CEN	5	2	1	2	1	3	6	4	.	1	26
115905	RX VIR	.	.	.	.	.	.	11	.	.	.	11
115919	R COM	.	.	1	2	2	8	22	11	.	.	46
120012	SU VIR	2	1	2	1	1	3	3	5	.	.	18
120206	RW VIR	.	.	.	.	.	.	9	.	.	.	9
120905	T VIR	.	.	.	1	.	2	10	4	4	.	18
121418	R CRV	.	.	3	2	2	4	3	1	.	.	15
122001	SS VIR	.	.	8	4	3	2	4	1	.	.	22
122532	T CVN	1	1	1	2	2	4	9	6	1	.	27
122803	Y VIR	.	.	.	1	6	1	2	2	.	.	12
122854	U CEN	2	2	1	4	4	1	6	6	2	2	30
123160	T UMA	20	15	14	9	5	12	34	76	36	12	233
123307	R VIR	1	1	1	2	3	10	16	9	2	.	45

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Desig.	Name.	Pages	55	132	204	268	329	403	470	549	610	679	Totals
123459	RS UMA		14	2	6	5	17	20	58	25	.	7	154
123556	Y UMA		.	.	.	.	.	.	2	.	.	.	2
123961	S UMA		47	15	7	17	26	52	96	63	18	19	360
124204	RU VIR		1	1	1	1	1	3	5	5	.	.	18
124606	U VIR		1	1	1	1	1	5	8	4	.	.	22
130212	RV VIR		.	.	.	.	2	2	12	4	.	.	20
131283	U OCT		6	6	5	3	5	6	4	12	5	5	57
132202	V VIR		.	.	.	.	.	2	3	2	.	.	7
132422	R HYA		7	1	3	6	10	22	20	32	8	5	113
132706	S VIR		.	1	2	1	6	18	55	23	9	4	119
133155	RV CEN		6	3	1	4	4	3	6	6	2	2	37
133273	T UMI		5	1	1	1	2	8	8	9	4	4	43
133633	T CEN		7	1	4	7	3	13	17	17	4	14	87
134236	RT CEN		7	.	.	1	3	3	6	3	1	2	26
134440	R CVN		10	1	1	1	8	6	14	17	7	12	77
134536	RX CEN		6	1	.	1	1	1	3	1	3	2	19
134677	T APS		3	4	5	8	8	6	5	7	5	6	57
135908	RR VIR		.	1	.	1	1	1	4	1	.	.	9
140113	Z BOO		1	.	.	.	1	5	10	9	3	3	32
140512	Z VIR		.	1	.	1	.	1	2	.	.	.	5
140528	RU HYA		4	.	.	1	1	7	7	9	2	3	34
140959	R CEN		7	5	2	4	9	18	11	19	6	10	91
141567	U UMI		18	2	2	1	4	12	8	11	6	3	67
141954	S BOO		16	2	2	2	2	.	22	35	12	12	105
142205	RS VIR		.	.	.	.	.	1	.	.	.	.	1
142539a	V BOO		14	2	3	15	16	21	44	46	17	10	188
142584	R CAM		12	.	2	.	1	6	34	31	8	8	102
143227	R BOO		3	1	2	.	8	5	10	15	7	7	58
144918	U BOO		.	.	1	.	.	2	4	8	.	1	16
145254	Y LUP		4	1	.	1	2	2	7	11	2	3	33
145971	S APS		8	7	5	5	8	12	8	11	4	6	74
150018	RT LIB		.	.	1	1	1	.	.	2	1	.	6
150519	T LIB		.	.	.	.	1	1	2	1	.	.	5
150605	Y LIB		.	.	1	2	3	1	4	2	.	.	13
151520	S LIB		.	.	.	1	4	1	5	7	2	.	20
151714	S SER		11	.	2	2	1	4	11	10	5	5	51
151731	S CRB		28	4	4	20	6	18	20	18	6	11	135
151822	RS LIB		6	4	.	2	2	8	11	17	7	8	65
152714	RU LIB		.	.	1	2	2	2	3	3	1	.	14
152849	R NOR		6	3	.	1	2	9	7	12	4	7	51
153020	X LIB		5	.	.	.	1	1	2	1	2	2	14
153215	W LIB		3	1	.	.	1	1	3	2	1	1	13
153378	S UMI		16	4	9	3	7	18	45	24	9	10	145
153620a	U LIB		3	.	.	.	1	1	2	1	2	2	12
153654	T NOR		1	.	.	.	1	1	2	1	1	2	9
154428	R CRB		240	53	38	28	38	100	177	184	91	65	1014
154536	X CRB		5	2	1	1	.	5	10	12	5	7	48
154615	R SER		3	1	2	1	3	8	38	14	.	4	74
154639	V CRB		8	1	2	1	1	5	12	10	8	8	56
154715	R LIB		.	.	.	.	1	1	2	1	.	.	4
155018	RR LIB		1	.	1	2	3	2	3	4	5	.	21
155229	Z CRB		2	1	.	.	.	.	3	3	1	3	13
155823	RZ SCO		1	2	1	1	1	6	6	14	3	6	41
160021	Z SCO		5	4	.	1	2	3	6	5	4	4	34
160118	R HER		3	2	1	1	2	4	5	5	3	8	34
160210	U SER		11	1	.	1	2	5	9	10	.	7	46
160221a	X SCO		3	.	.	.	.	1	3	2	2	1	12
160325	SX HER		38	5	2	8	8	24	48	36	25	16	210
160519	W SCO		.	.	.	.	1	1	2	1	2	2	9
160625	RU HER		3	1	1	1	1	3	11	12	5	3	41
161122a	R SCO		3	2	.	.	1	.	4	9	5	4	28

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Desig.	Name.	Pages	58	133	205	270	331	405	474	553	612	681	Totals
161122b	S	Sco	6	3	2	1	2	4	4	5	3	4	34
161138	W	CrB	4	2	2	1	1	5	10	10	8	11	54
161607	W	Oph	2	1	1	2	3	2	1	2	2	2	18
162112	V	Oph	2	1	1	1	1	3	4	3	2	1	19
162119	U	Her	25	.	3	1	1	12	23	16	12	13	106
162319	Y	Sco	.	.	.	.	.	.	.	.	1	.	1
162807	SS	Her	11	.	1	2	2	3	10	6	3	1	39
162815	T	Oph	4	.	.	1	2	2	8	3	2	1	23
162816	S	Oph	5	1	.	1	1	1	5	3	1	1	19
163137	W	Her	15	3	2	1	1	2	5	7	4	4	44
163172	R	UMi	.	.	.	.	.	.	3	5	.	3	11
163266	R	Dra	19	3	3	1	2	2	9	20	14	12	85
164319	RR	Oph	.	.	.	2	2	1	4	5	3	2	19
164715	S	Her	27	3	1	1	.	3	5	8	6	7	61
164844	RS	Sco	6	6	2	.	1	6	9	17	8	7	62
165030	RR	Sco	6	3	.	.	1	1	3	4	2	1	21
165202	SS	Oph	.	.	1	1	1	1	2	2	4	1	13
165631	RV	Her	18	6	1	1	1	4	4	7	7	5	54
165636	RT	Sco	5	3	2	.	1	1	2	1	1	1	17
170215	R	Oph	54	1	.	.	1	5	18	34	11	4	128
170627	RT	Her	3	.	1	.	.	5	7	8	3	5	32
170833	RW	Sco	6	1	.	.	.	1	2	4	2	1	17
171401	Z	Oph	8	1	1	1	1	1	3	2	3	3	24
171723	RS	Her	11	6	7	1	1	5	9	8	5	6	59
172486	S	Oct	4	1	4	4	6	10	7	6	3	4	49
172809	RU	Oph	2	.	1	1	1	1	2	2	1	4	15
173411	RT	Ser	1	.	.	.	1	.	.	.	.	.	2
173543	RU	Sco	6	3	2	2	1	1	2	4	2	1	24
174135	SV	Sco	6	1	.	.	1	1	3	2	1	1	16
174162	W	Pav	6	1	3	1	1	2	9	9	3	5	40
174406	RS	Oph	1	1	.	1	1	1	2	2	1	1	11
174551	U	Ara	.	3	3	.	.	1	1	7	3	3	21
175111	RT	Oph	1	.	.	.	.	.	3	2	.	3	9
175458a	T	Dra	2	.	.	.	.	.	.	7	4	5	18
175458b	UY	Dra	1	.	.	.	.	.	.	5	4	5	15
175519	RY	Her	14	2	2	1	2	4	6	9	8	6	54
175654	V	Dra	3	2	2	1	1	.	.	1	.	1	11
180363	R	Pav	.	3	5	1	.	3	4	13	5	7	41
180531	T	Her	63	3	4	2	17	8	26	45	27	14	209
180565	W	Dra	18	3	.	1	.	2	17	11	3	.	55
180666	X	Dra	12	2	1	.	.	1	3	9	3	2	33
180911	Nov.	Oph	2	1	.	.	1	1	2	1	1	2	11
181031	TV	Her	.	.	.	.	.	2	1	.	1	.	4
181103	RY	Oph	13	1	.	.	1	7	13	23	9	9	67
181136	W	Lyr	38	10	11	1	3	6	39	16	18	19	161
182133	RV	Sgr	5	2	2	1	1	1	3	3	1	1	20
182224	SV	Her	2	.	1	.	1	.	1	1	2	3	11
182306	T	Ser	4	2	.	1	1	1	23	.	.	.	32
183149	SV	Dra	2	.	.	.	.	.	.	.	2	1	5
183225	RZ	Her	.	1	.	.	.	.	.	.	.	.	1
183308	X	Oph	23	2	4	2	3	4	.	31	12	11	92
184134	RY	Lyr	2	1	3	1	1	1	1	1	1	.	12
184205	R	Sct	236	38	32	16	23	22	86	131	115	45	744
184243	RW	Lyr	1	.	.	.	.	.	.	.	4	4	9
184300	Nov.	Aql	22	13	7	1	3	6	14	16	7	9	98
185032	RX	Lyr	3	2	2	.	2	4	2	1	2	1	19
185243	R	Lyr	.	.	.	.	.	.	.	.	.	9	9
185437a	S	CrA	5	4	2	1	1	1	4	3	4	2	27
185512a	ST	Sgr	.	1	.	.	.	4	5	2	4	1	17
185537a	R	CrA	5	2	1	.	1	1	5	3	3	2	23
185537b	T	CrA	4	1	1	.	1	1	2	2	2	.	14

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Desig.	Name.	Pages	61	135	206	270	332	407	477	556	614	683	Totals
185634	Z	LYR	3	4	.	1	1	1	2	.	1	3	16
185737	RT	LYR	1	1	1	.	1	2	1	2	1	1	11
185905	V	AQL	3	.	.	.	.	.	.	.	.	.	3
190108	R	AQL	10	4	.	1	1	3	8	8	4	8	47
190529a	V	LYR	2	2	.	.	.	.	3	4	3	1	15
190818	RX	SGR	1	2	1	.	.	1	3	3	3	5	19
190819a	RW	SGR	4	2	.	.	.	3	5	3	6	5	28
190907	TY	AQL	3	1	.	.	.	1	2	2	.	1	10
190925	S	LYR	14	3	2	.	.	2	2	8	2	3	36
190926	X	LYR	2	1	1	1	1	1	2	2	1	1	13
190933a	RS	LYR	6	1	1	1	1	5	6	7	1	1	30
190941	RU	LYR	5	2	1	1	1	.	.	3	2	.	15
190967a	U	DRA	9	3	3	1	1	3	4	10	6	2	42
191007	W	AQL	3	2	.	.	.	2	3	5	4	2	21
191017	T	SGR	3	2	1	.	.	3	3	6	6	3	27
191019	R	SGR	11	8	1	.	.	6	12	6	8	4	56
191033	RY	SGR	42	12	7	4	1	8	17	38	28	24	181
191124	TY	SGR	3	2	2	1	.	1	2	1	1	1	14
191319	S	SGR	8	4	1	1	.	1	4	3	3	3	28
191331	SW	SGR	3	1	1	1	1	1	2	1	1	1	13
191350	TZ	CYG	5	3	1	1	1	1	2	2	2	1	19
191637	U	LYR	2	1	1	1	1	1	2	2	.	1	12
191717	T	SGR	.	.	.	.	.	.	1	.	.	.	1
192745	AF	CYG	4	21	8	.	11	.	.	.	.	.	44
192928	TY	CYG	3	3	2	1	.	2	1	4	4	2	22
193311	RT	AQL	6	3	3	1	1	4	5	6	5	4	38
193449	R	CYG	106	32	26	1	4	11	17	30	23	38	288
193509	RV	AQL	3	2	2	.	1	1	2	3	2	1	17
193972	T	PAV	6	6	9	2	3	5	7	14	6	4	62
194048	RT	CYG	59	17	13	1	2	8	19	12	10	22	163
194348	TU	CYG	12	8	4	1	2	4	7	10	9	3	60
194604	X	AQL	7	2	5	.	1	4	7	5	3	8	42
194632	χ	CYG	27	26	51	29	10	17	17	21	10	15	223
194939	RR	SGR	5	3	2	4	3	1	2	1	2	1	24
195142	RU	SGR	6	5	10	5	.	1	5	11	7	8	58
195202	RR	AQL	5	2	.	.	.	.	1	3	2	2	15
195308	RS	AQL	3	1	.	.	.	.	.	1	.	1	6
195553	NOV.	CYG	21	9	11	4	3	8	13	11	5	5	90
195849	Z	CYG	11	4	12	2	1	6	12	12	6	3	69
195855	S	TEL	3	1	1	1	1	1	2	1	1	1	13
200212	SY	AQL	2	2	2	.	1	2	2	4	2	3	20
200357	S	CYG	17	9	9	1	1	8	10	17	10	9	91
200514	R	CAP	10	4	.	.	.	1	2	3	1	2	23
200647	SV	CYG	1	1	.	.	.	.	.	.	.	.	2
200715a	S	AQL	7	4	3	.	.	3	11	24	9	11	82
200715b	RW	AQL	5	3	1	.	1	.	2	2	1	3	18
200747	R	TEL	3	.	1	2	4	1	3	2	1	1	18
200812	RU	AQL	13	1	.	.	.	1	1	7	1	3	27
200822	W	CAP	6	3	2	1	.	1	3	1	1	1	19
200906	Z	AQL	5	4	2	.	1	1	2	3	3	3	24
200916	R	SGE	1	2	.	.	.	.	.	1	.	1	5
200938	RS	CYG	39	21	14	2	8	18	31	52	21	23	229
201008	R	DEL	14	7	2	.	1	1	3	4	4	4	40
201121	RT	CAP	8	1	3	.	.	.	3	4	1	1	21
201130	SX	CYG	11	6	3	.	.	.	1	5	2	5	33
201139	RT	SGR	7	3	2	4	.	1	2	2	2	1	24
201437b	WX	CYG	45	22	13	1	1	8	11	28	9	10	148
201647	U	CYG	56	34	25	1	2	5	15	21	10	12	181
202240	U	MIC	5	2	2	4	2	1	2	1	1	1	21
202817	Z	DEL	23	10	2	.	.	.	2	9	1	6	53
202946	SZ	CYG	41	13	15	11	7	11	33	39	21	15	206

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Desig.	Name.	Pages	65	136	207	271	333	408	479	559	616	685	Totals
202954	ST CYG	12	4	5	2	2	3	7	10	4	3	52
203226	V VUL	2	1	.	1	1	1	2	2	1	1	12
203439	R MIC	4	3	2	2	1	1	2	1	2	1	19
203611	Y DEL	3	1	1	.	.	.	.	1	.	2	8
203816	S DEL	5	7	2	1	1	1	2	2	2	2	25
203847	V CYG	23	10	9	1	7	9	16	20	8	10	113
203905	Y AQR	8	4	1	.	.	.	.	2	4	6	25
204016	T DEL	26	11	14	.	.	2	9	13	5	10	90
204102	V AQR	8	3	1	.	.	1	3	2	2	2	22
204104	W AQR	4	.	.	.	.	.	.	1	4	3	12
204215	U CAP	3	3	1	1	.	.	2	.	2	4	16
204318	V DEL	7	2	2	.	.	.	.	4	3	4	22
204305	T AQR	8	2	1	.	.	3	3	12	13	7	49
204846	RZ CYG	23	7	8	2	.	5	11	17	7	8	88
204954	S IND	3	1	1	2	2	4	3	2	1	1	20
205017a	X DEL	9	4	3	1	.	.	4	8	4	5	38
205923a	R VUL	12	7	5	1	1	3	19	39	22	22	131
205923b	— VUL	.	.	.	.	.	.	.	2	.	.	2
210124	V CAP	3	2	2	4	1	.	2	1	2	2	19
210129	TW CYG	7	4	2	.	.	.	.	.	2	.	17
210221	X CAP	3	1	1	2	.	.	2	.	2	1	12
210382	X CEP	1	3	1	.	.	.	.	2	3	1	11
210504	RS CAP	9	2	2	.	.	.	2	3	3	2	23
210516	Z CAP	6	1	.	.	.	.	1	1	1	2	12
210812	R EQU	4	.	4	1	.	3	6	7	6	4	35
210868	T CEP	71	16	14	4	2	14	66	45	32	34	298
210903	RR AQR	6	2	.	.	.	1	2	2	2	3	18
211614	X PEG	4	4	4	1	.	3	7	17	8	10	58
211615	T CAP	7	3	1	3	.	.	2	.	3	4	23
212030	S MIC	6	2	3	4	2	1	2	2	5	1	28
212814	Y CAP	4	3	2	2	.	.	1	.	3	4	19
213244	W CYG	33	8	21	6	2	4	10	10	21	.	115
213678	S CEP	21	5	5	1	1	.	19	23	5	4	84
213753	RU CYG	1	5	3	1	1	1	2	3	.	3	20
213843	SS CYG	326	137	110	40	42	39	112	200	140	74	1220
213937	RV CYG	5	1	3	21	1	1	2	2	1	1	38
214024	RR PEG	6	5	4	1	1	3	8	7	8	5	48
214247	R GRU	5	6	9	6	3	1	2	6	7	11	56
215605	V PEG	13	2	4	.	.	1	3	7	2	2	34
215717	U AQR	5	2	.	.	.	.	2	2	2	2	15
215934	RT PEG	14	2	10	.	1	1	2	7	5	4	46
220133a	RY PEG	2	2	3	1	1	1	.	.	.	1	11
220133b	RZ PEG	7	3	3	1	.	.	2	2	1	1	20
220412	T PEG	2	3	2	.	1	.	.	1	2	5	16
220613	Y PEG	7	3	3	.	.	.	1	4	4	5	27
220714	RS PEG	14	5	5	1	.	.	1	3	3	5	37
221938	T GRU	.	3	.	4	1	.	.	2	2	3	15
221948	S GRU	.	3	6	4	4	.	.	5	2	6	30
222129	RV PEG	2	2	2	.	.	.	.	2	2	2	12
222439	S LAC	16	10	9	3	.	1	4	7	5	4	59
222867	R IND	4	3	2	3	1	1	5	1	1	1	22
223462	T TUC	.	1	6	4	4	.	.	5	4	7	31
223841	R LAC	10	6	6	2	1	.	1	5	3	4	38
225120	S AQR	1	2	.	.	.	.	.	.	.	.	3
225914	RW PEG	10	2	3	.	.	.	.	1	3	2	21
230110	R PEG	6	6	3	4	1	.	7	12	8	8	55
230759	V CAS	20	9	8	3	8	6	4	13	5	9	85
231425	W PEG	15	15	4	2	2	.	1	5	7	1	52
231508	S PEG	5	5	5	1	.	.	2	3	3	2	26
231878	RY CEP	.	.	.	.	.	1	.	1	.	.	2
233746	V PHE	.	3	6	4	4	.	.	1	2	7	27

ANNUAL SUMMARY FOR 1925—Continued.

Desig.	Name. Pages	69	139	209	272	333	409	481	562	618	686	Totals
232846	Z AND	3	3	2	2	2	2	6	4	4	1	29
233335	ST AND	9	5	6	2	2	2	2	3	3	4	38
233815	R AQR	32	7	3	1	4	2	.	3	8	4	64
233956	Z CAS	15	6	9	2	.	5	8	9	7	7	68
235053	RR CAS	7	4	3	1	1	1	3	3	3	4	30
235209	V CET	5	2	2	1	2	1	.	.	1	1	15
235265	R TUC	3	.	.	1	2	3	.	2	1	1	13
235350	R CAS	16	16	8	9	4	3	17	11	5	4	93
235525	Z PEG	4	5	5	1	.	.	2	3	2	.	22
235855	Y CAS	2	2	.	.	.	.	.	3	2	2	11
235939	SV AND	11	11	7	5	3	1	4	4	4	5	55
Totals		4075	1828	1994	1359	1522	2212	3272	3326	1952	1835	23375

LEON CAMPBELL, Recording Secretary.

November 10, 1925.

COMET NOTES.

Two New Comets.—Two new comets were discovered during November, both of them bright enough for amateurs to observe with small telescopes.

The first was discovered by Mr. Peltier of Delphos, Ohio, on the night of Nov. 14. It was then in the northern part of the constellation Bootes. Unfortunately the discovery was not verified and generally announced until several days later, when observations by Guthnick at Prag on Nov. 18, and by Wilk at Cracovie on Nov. 19, of a comet in the constellation Hercules, proved to be of the same comet.

This comet is moving rapidly across the heavens and during December will be passing through Aquila into Capricorn. Its brightness has been of magnitude 7, so that it could be observed in full moonlight with large telescopes, but will diminish to about magnitude 9 in the latter part of December.

The following observations have come to hand:

OBSERVATIONS OF PELTIER'S COMET *j* 1925.

Date U. T. 1925	α 1925.0 h m s	δ 1925.0 ° ′ ″	Observer	Place
Nov. 14.00	15 25	+44	Peltier	Delphos
18.7379	17 01 37	+35 28 20	Guthnick	Prag
19.7153	17 18 28	+33 04	Wilk	Cracovie
22.0272	17 51 03.1	+27 19 04	Rossiter	Ann Arbor
23.1293	18 04 34.2	+24 33 45	Jeffers	Mt. Hamilton
26.0179	18 33 47.8	+17 47 04.8	Gingrich	Northfield

At our request Professor Van Biesbroeck has sent in the preliminary elements and ephemeris of Peltier's comet given below, computed by himself and Otto Struve from observations on November 18, 24 and 28. Professor Van Biesbroeck writes that he got the last observation in the early evening ($6^h 06^m$ P. M.) of the 27th, reduced it immediately and with Struve got out an orbit that was finished about midnight. In Universal Time the observation was made 6 minutes after the beginning of November 28, so that the observation, the orbit and the ephemeris, which was calculated in the morning, were all obtained and mailed for publication on the same day. Something of a record!

The second comet was discovered by Professor Van Biesbroeck of the Yerkes Observatory on the morning of November 17. The interesting circumstances at-

tending the discovery are given in the note below, signed by the discoverer himself.

This comet was then in the southeast corner of Canes Venatici, not far from the hind foot of the Great Bear, and has been moving slowly southward. In December it will be in the western part of the faint constellation known as Coma Berenices.

As seen with the 5-inch finder, and with our 16-inch telescope on the morning of November 21, the comet was of about magnitude 9, with a tail 10′ to 15′ long, and looked like a miniature of a great comet. A photograph taken by Dr. Gingrich with the 6-inch doublet on the morning of November 20, with an exposure of 50 minutes, shows the tail of the comet quite distinctly, extending to 15′ from the nucleus and spreading slightly.

The following observations of position of the comet have come to hand:

Observations of Van Biesbroeck's Comet *k* 1925.

Date U. T. 1925	α 1925.0 h m s	δ 1925.0 ° ′ ″	Observer	Place
Nov. 17.4805	11 56 32.6	+34 55 08	Van Biesbroeck	Williams Bay
18.5163	11 57 24.6	+35 33 39	Jeffers	Mt. Hamilton
19.5173	11 58 14.8	+34 13 08	Jeffers	Mt. Hamilton
21.4694	11 59 44.6	+33 33 31	Gingrich	Northfield

The elements and ephemeris given below have been calculated by Professor Van Biesbroeck and Mr. Bobrovnikoff from observations by the discoverer November 17, 21, and 25. The ephemeris shows that the comet might have been discovered months before it was, had anybody stumbled upon it. It will be in good position for observation during December.

Elements of Comet Peltier.

Parabolic elements by G. Van Biesbroeck and O. Struve from observations November 18, 24, and 28.

T = 1925 Dec. 7.265
ω = 126° 25′
Ω = 140 50
i = 144 35
q = 0.7633

$\Delta\lambda \cos\beta = -0'.4$ $\Delta\delta = -0'.1$

1925	α 1925.0 h m s	δ 1925.0 ° ′	Log Δ	M
Nov. 28.0	18 49 40	+13 35	9.863	7.3
Dec. 2	19 13 56	+ 6 31		
6	31 03	+ 0 58	9.984	7.8
10	43 30	− 3 26		
14	52 49	− 7 00	0.085	8.4
18	20 00 00	− 9 58		
22	05 38	−12 29	0.164	8.9
26	10 25	−14 38		
30	14 24	−16 31	0.224	9.4

Magnitude observed Nov. 28.0 = 7M.3.

Elements of Comet Van Biesbroeck.

Computed by Van Biesbroeck and Bobrovnikoff from observations by the discoverer on November 17, 21 and 25.

T = 1925 Oct. 5.9032 U. T.
ω = 110° 14′.5
Ω = 334 23.7 } 1925.0
i = 50 25.1
q = 1.6236

Representation of the middle-position: $\Delta\lambda \cos\beta = -2''.1$, $\Delta\delta = -0''.8$.

EPHEMERIS FOR 0^h U. T.

1925		α 1925.0	δ 1925.0	Log r	Log Δ	M
		h m s	° ′			
Aug.	1	4 13 32	+62 17	0.266	0.314	8.6
Sept.	1	8 00 51	65 05	.228	.276	8.2
Oct.	1	10 29 23	54 07	.211	.263	8.1
Nov.	29	12 04 19	31 05	.250	.219	8.0
Dec.	3	5 58	29 51			
	7	7 09	28 38	.261	.207	8.0
	11	7 37	27 29			
	15	7 31	26 19	.273	.193	8.0
	19	6 49	25 12			
	23	5 28	24 07	.285	.180	8.0
	27	3 27	23 03			
	31	12 00 43	+22 00	0.298	0.166	8.0

Magnitude at discovery 8^M.

The object was discovered when near theoretical maximum brightness and according to the ephemeris its magnitude should hardly vary for another month. The actual observed brightness has, however, shown a rapid decline. It is seen that the object has been visible in the northern hemisphere for a long time before the discovery.

ELEMENTS OF COMET VAN BIESBROECK

by Maxwell and Damgard (Berkeley) from observations Nov. 17, 18 and 19.

T = Sept. 28.59
ω = 85° 17′
Ω = 335 56
i = 41 04
q = 1.211

EPHEMERIS.

	h m s	° ′	H
Nov. 21	11 59 24	+33 43	0.971
25	12 00 02	32 26	
29	02 02	31 13	
Dec. 3	12 05 26	+30 05	0.685

Discovery of a New Comet; a Curious Coincidence.—On November 16, the Yerkes Observatory received a telegram from Dr. Shapley, director of the Harvard College Observatory, asking us to check a probable comet in position:

15^h 25^m and +44°, motion southeast.

The date was given as Nov. 13, but no name of observer nor location were added. The position being almost in conjunction with the sun, the region was in reach in the evening as well as in the morning sky. Clouds prevented observations after sunset, but the sky cleared in the middle of the night and it was quite transparent in the early morning hours of Nov. 17. A visual search with the 4-inch finder of the large refractor did not bring out any suspicious object. After about an hour I abandoned the search, depending on my colleague Ross for a more thorough survey of the field, which he photographed with the Bruce telescope. Incidentally, I might add that his scouting of the plate was not successful, and that up to this moment we have not learned anything further about the questionable object.

The seeing being too poor for double star work, I used the 40-inch refractor for getting some cometary positions: periodic comet Faye, which was found as

faint as 14M; periodic comet Borelly, magnitude 10, with well defined nucleus; and finally comet Shajn, which has the record of the largest perihelion distance; its brightness was estimated 12M.5. It has a sharp nucleus of magnitude 13M.5.

Since the sky was unusually transparent I thought this might be an opportunity for examining whether Comet Orkisz, found last spring, would still be in reach of visual observations. Its distance is now over 4 astronomical units, and I hardly expected to see it. In turning the telescope to the place and locating the field in the finder, lo! there was a good-looking comet, with a well defined nucleus and a tail estimated about 30′ in length; the total brightness was estimated extrafocally as 8 magnitude, while the nucleus was given 9 magnitude. In the large telescope the latter appeared only a couple of seconds in diameter, but it was surrounded by a sharply outlined paraboloid envelope. The object was first seen at 11h 10m U. T. I at once measured the position visually with the result:

Nov. 17.48052 Universal Time 11h 56m 32s64 +34° 55′ 08″.3 (1925)

and repeated the measures after nearly 30 minutes, after which the object was lost in the dawn (12h 03m U. T.). This gave the daily motion:

+58s —20″.7.

These data were telegraphed to the Harvard Observatory, for further distribution. Up to the time of writing no other observations have come to our knowledge except our own measures on the two succeeding mornings:

Nov. 18.40326	11h 57m 18s96	+34° 35′ 57″.9 (uncertain)
19.40764	11 58 09.29	34 15 20.3

These were obtained photographically with the 24-inch reflector, but only the position on Nov. 19 was forwarded telegraphically, because on Nov. 18 the exposures were made through clouds and the images are extremely faint and diffuse. The diurnal motion being small and very nearly uniform, there is little prospect of obtaining reliable information about the orbit from this material. A rough computation indicates that the object is not identical with DeVico's periodic comet, the return of which has been expected for several years, and furthermore that the distance to the earth seems to be slowly increasing.

G. Van Biesbroeck.

Williams Bay, Nov. 19.

P. S. November 21.

The comet is rapidly fading. Its brightness is diminishing much faster than is indicated by the first ephemeris just received from Berkeley. From 8M.0 at the time of discovery (Nov. 17.48) the brightness has dropped this morning (Nov. 21.48) to 9M.3. Also the tail was considerably shorter, not over 10′ in length. Photographically the object is quite inactive. An exposure of one hour with the 24-inch reflector did not bring out the tail any longer than was perceived visually in the 4-inch finder.

As to Comet Orkisz, I located it near the ephemeris position, as a small round nebulosity of about 15M. —G. V. B.

Ephemeris of Comet 1918 III (Schorr).—The accompanying is an ephemeris of Comet Schorr (1918 III) based upon some elements that I computed some time ago. My time of perihelion passage for the 1925 return is .45 of a day earlier (10h 48m) than one or two others make it. This comet belongs to the Jupiter family. Its aphelion distance is 5.2113 units. It will be in opposition January 26, 1926, in Cancer.

1926		α h m s	δ ° ′ ″	Log r	Log Δ
Jan.	1	8 55 25	+17 45 32	0.40746	0.22134
	9	8 49 24	+18 28 56	0.41420	0.21914
	17	8 42 18	+19 15 01	0.42090	0.22142
	25	8 34 51	+20 00 12	0.42744	0.22834
Feb.	2	8 27 30	+20 41 58	0.43392	0.23985
	10	8 20 53	+21 18 06	0.44030	0.25550
	18	8 15 26	+21 47 19	0.44660	0.27464
	26	8 11 28	+22 09 13	0.45276	0.29636
Mar.	6	8 09 08	+22 23 53	0.45884	0.31991
	14	8 08 24	+22 31 57	0.46484	0.34452
	22	8 09 23	+22 33 54	0.47068	0.36950

FRANK E. SEAGRAVE.

Boston, Nov. 4, 1925.

GENERAL NOTES

Eclipse Expedition to Sumatra. — Professor Harlan T. Stetson, director of Harvard Astronomical Laboratory, sends us the following statement concerning an expedition to observe the total eclipse of the sun on January 14, 1926. The party was embarking from San Francisco for Benkoelen, Sumatra, on November 7.

The third expedition to leave the United States to observe the eclipse of the sun of January 14, 1926, sailed from San Francisco November 7 on the *President Harrison* of the Dollar Line.

The party consists of Dr. H. T. Stetson, assistant Professor of Astronomy in Harvard University; Dr. W. W. Coblentz, physicist of the U. S. Bureau of Standards; Mr. Weld Arnold, Harvard '17, of the School of Surveying of the American Geographical Society; and Mr. W. A. Spurr, Harvard '25, a student of Astronomy.

The program will consist principally of radiometric and photometric investigations of the corona, using a modified reflecting telescope of 20 inches aperture, vacuum thermocouples, and auxilliary apparatus. Photographic and visual determinations of the color index and brightness of the coronal light will also be included in the program.

The destination will be Benkoelen, on the west coast of Sumatra, where also will be located the expedition of Swarthmore College.

Syracuse Astronomical Society.—The following, sent us by Professor E. D. Roe, gives a list of the lectures which have been given before the Syracuse Astronomical Society since 1920, together with the other activities of the Society. It shows how interest may be kept up in a live subject by the activity of a few live men, and may give some hints to the leaders in other astronomical societies.

OUTLINE OF ACTIVITIES OF SYRACUSE ASTRONOMICAL SOCIETY SINCE 1920.

Nov. 28, 1920. "Comets." Dean Henry A. Peck.
Feb. 17, 1921. "Systems of Suns." Prof. E. D. Roe, Jr.
April 7, 1921. "The Spectroscope." Prof. R. A. Porter.
Dec. 8, 1921. "The Historical and Cultural Aspects of Astronomy." Rev. Dr. Jeremiah Zimmerman, LL. D. Dinner. Officers re-elected. Voted that the Society subscribe for two Astronomical Periodicals.

Jan. 22, 1922. Bulletin 4 announces section lectures on "Constellations," by Dr. Kullmer, and "Double Stars," by Dr. Roe.

Feb. 2, 1922. "The Spectra of the Stars." Dean W. P. Graham.

March 25, 1922. "Copernicus and Galileo." Voted that the Society pay for the printing of Star Maps used in the Study of the Constellations, purchase a number of slides, and also have the Constitution and By-Laws printed.

May 15, 1922. "Weather Forecasting in Relation to the Student of Astronomy." Forecaster Morgan R. Sanford, U. S. Weather Bureau. Dinner.

Nov. 14, 1922. "The Age of the Earth." Prof. Louis Ploger. Officers re-elected except Treasurer. Ward J. Hager, Treasurer.

Feb. 1, 1923. "The Interferometer." Prof. Charles L. Brightman.

March 2, 1923. "The Heat of the Sun and Other Stars." Dr. C. G. Abbot. Dinner before the lecture.

April 26, 1923. "Origin of the Earth." Prof. H. N. Eaton.

Nov. 27, 1923. "Babylonian Cosmogony." Prof. Ismar J. Peritz. Officers re-elected.

Feb. 21, 1924. "Astronomical Photography." Prof. Frank Schlesinger. Dinner.

March 31, 1924. Bulletin announcing 6 section lectures on the "Constellations," by Dr. C. J. Kullmer. Dr. Roe gave a series of 6 section lectures on the "Solar System," beginning Thursday evening, April 10.

May 13, 1924. Prof. E. D. Roe, Jr.

Nov. 13, 1924. Bulletin announcing a series of 8 section lectures on "Mars and Other Planets," by Dr. Roe. Lectures began on Nov. 24 and were concluded March, 1925.

Jan. 10, 1925. "Eclipses of the Sun." Prof. J. A. Miller. Dinner.

April, 1925. Bulletin announcing a course of 6 section lectures on the "Constellations and Simple Motions of the Heavenly Bodies."

All the lectures with two exceptions were given with lantern.

In each year in addition to the public lectures mentioned above, two sections have been maintained, one on "The Constellations," by Dr. and Mrs. Nassau or Dr. Kullmer, and one on "The Sun" or "The Solar System" or "The Planets" or "Mars and Other Planets" or "Double Stars," by Dr. Roe.

Note on the Secondary Spectrum and Mass Function of υ Sagittarii. — From calculations based on some remarks concerning the superposed secondary spectrum and double lines that are shown at times on the Harvard spectrograms of υ Sagittarii (Pop. Ast., **29**, 636, 1921), Ludendorff derives the enormous masses of 260 and 54 times the sun (Sitz. d. Preuss. Akad. d. Wiss., **9**, 67, 1924).

It was stated in the note in Popular Astronomy that the double lines indicated a relative velocity of approach of about 280 km/sec. for the faint companion, but that no reverse doubling had been found. The velocity was based on preliminary measures of several fine plates and was estimated before the precise phase of the doubling, computed from R. E. Wilson's orbit, was known.

About two hundred spectrograms of this star have been obtained since 1888. The change from the usual cF2 type to B8, first discovered by Miss Cannon, is unmistakable, and in some plates the lines Hγ and Hδ are clearly double. In others all hydrogen lines are wide.

As the early plates were found to fall midway between the maximum and zero point on Wilson's velocity curve, the star was next watched at the maxima and minima; but the expected changes of spectrum were not found. An unsuc-

cessful attempt was then made to obtain a correction to Wilson's period which would make the crests of the velocity curve occur at the observed times of doubling.

It now seems clear that the B8 spectrum appears only near the zero point, when the stars are crossing the line of sight with the faint companion (B8) in front. It may begin some ten or fourteen days preceding the crossing of the line of sight and last possibly for a longer time afterward. (The period is 138 days.) The superposed B8 spectrum becomes gradually visible, reaches a maximum, when it effaces all the fainter lines of the primary, and then slowly fades. The phenomenon is probably an eclipse or presentation effect and is being further investigated from this standpoint. The time and duration of the phenomenon seem to vary in different revolutions, as does also its degree. In some cycles the spectrum is observed to be pure cF2 close to this zero point.

Nearly a hundred Harvard plates of good quality, taken in phases more remote from the zero point, fail to show any traces of the B8 spectrum. Some, however, show hazy lines in place of the usually extremely sharp ones, while in others certain conspicuous lines of the rich metallic spectrum of the cF2 primary are lost or very dim. The Hβ line, as has long been known, is also reversed or invisible at times. Another abnormality is the occurrence of lines of helium in the spectrum of the cF2 star.

No photograph has so far been obtained in which the B8 lines can with certainty be said to lie to the red of those of the primary. This may be because the widened lines are less well resolved in the plates taken during its approach. Until, however, this reverse separation is obtained, it is uncertain whether the doubling observed indicates true orbital velocity or a displacement due to some other cause—it may be similar, for example, to the permanent shift toward blue seen in the hydrogen and helium lines of the companion of β Lyrae.

In the absence of further evidence, any conclusion as to the masses remains at least extremely doubtful. (A. C. MAURY)

Harvard College Observatory Bulletin 824.
Cambridge, Massachusetts, September 30, 1925.

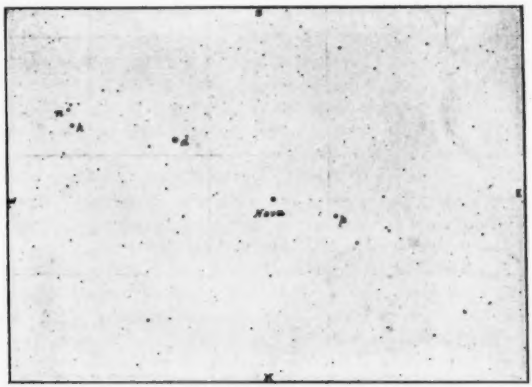
Wolf's Nova in Aquila (Nova Aquilae 1925.7). — An examination of 130 Harvard photographs taken between 1899 and September 8, 1925, shows no trace of the object discovered by Wolf (B. Z., No. 33, 1925). A few of these photographs were taken with large instruments so that stars to the fifteenth or sixteenth magnitude are visible, but on the greater number the limiting magnitude is about twelve. On August 25, 1925, the object is invisible on a plate showing stars of the eleventh magnitude. On September 8, 1925, it was of the photographic magnitude 9.8 on the International Scale. A maximum of 9.2 was reached on September 23, and nine later plates extending to November 4 indicate that the brightness was nearly constant during that interval.

Photometric observations by Mr. Campbell on October 29 and November 4 gave the visual magnitudes 8.66 and 8.78, respectively. The color index of +0.5, if verified, is somewhat abnormal for a nova. Photographs of the spectrum have been taken with several instruments, and while the image is fairly strong, the class is not defined. There are traces of indistinct dark and bright lines, however, and a resemblance to the early spectrum of Nova Pictoris is suspected.

Harvard College Observatory Bulletin 826. (A. J. C.)
Cambridge, Massachusetts, November 9, 1925.

Wolf's New Star. —The accompanying photographic chart of the field of Wolf's new star was kindly sent us by Mr. G. Merton, of London, England. It

was prepared by Mr. Melotte from a photograph which he took at the Royal Observatory.



WOLF'S NOVA
$\alpha = 19^h\ 27^m\ 25^s$; $\delta = -6°\ 35'.2$ (1925.0)
1 réseau interval = 10′ = 40^s

The following table giving the required data concerning the chief stars in the field, is given in the B. A. A. Circular No. 13, October 25.

Star	B. D. No.	R. A. 1925.0	Decl. 1925.0	Mag.
	°	h m	° ′	
n	−6,5165	19 26.3	−6 43	9.08
k	−6,5166	19 26.3	−6 41	8.82
d	−6.5170	19 26.9	−6 40	7.28 (Harvard)
Nova (?)		19 27.4	−6 35	....
p	−6,5172	19 27.8	−6 34	9.24

The provisional magnitudes of the stars were determined independently by Mr. Bennett and Mr. Merton, with differences of only a few hundredths of a magnitude.

Nova Aquarii 1907,6. — Harvard photographs have been examined for a nova of the eighth magnitude discovered by Professor Frank E. Ross, of the Yerkes Observatory, on a plate of August 12, 1907. The position for 1900 is $21^h\ 6^m\ 48^s$, −9° 14′.3.

On 677 plates extending from 1890 to 1925, which show stars of magnitude 10.7 or fainter, no star is seen in this position except in August, 1907.

1907		Magnitude	
July	16	[12.0	
August	8	8.4	
"	12	9.1	(Ross)
"	14	9.7	
"	14	9.8	
"	16	10.2	
"	18	10.6	
"	27	12.6	

The nova faded quickly and evenly, and does not appear on later plates, including those taken with the Bruce 24-inch telescope, which show stars of the sixteenth magnitude. (IDA E. WOODS).

Harvard College Observatory Bulletin 826.
Cambridge, Massachusetts, November 9, 1925.